



AGRICULTURAL RESEARCH INSTITUTE

PUSA

J. Hector. Barnes.

Concordia tolli tibi Nomen Regni.

THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION OF FRIENDLY INTERCOURSE AMONGST PHARMACISTS.

This Association of Chemists and Druggists is managed by about twenty unpaid officers annually elected by the members.

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The chief business of the meetings is the communication of written descriptions of original investigations made by members during the year, and includes discussions on such papers by the assembled members and visitors.

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THE YEAR-BOOK OF PHARMACY AND TRANSACTIONS.

The Conference annually presents to members a handsome octavo volume of about 600 pages, containing the proceedings at the yearly meeting, and a report on the progress of pharmacy, or Year-Book, comprising abstracts of papers on pharmacy, materia medica, and chemistry, and on new preparations, processes, and formulae, published at home and abroad during each year. The funds of the Conference, composed of annual subscriptions of seven shillings and sixpence, are devoted to the production of this useful book, the cost of printing and binding being spared to make it the desk companion of the year, and an invaluable permanent work of reference for every chemist and druggist. The Executive Committee of the Conference trusts that members will show the current Year-Book to their friends and acquaintances—principals, assistants, and pupils—and obtain as large a number of new members as possible. Alphabetical lists of the names and addresses of subscribers will be found in each Year-Book.

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The Conference year commences on July 1st, and Annual Subscriptions are due in advance on that date. The amount, which includes free delivery of the Year-Book is 7s. 6d. for members residing in any European country, Canada, or the United States of America. For those resident in other countries, if the Year-Book be mailed direct to members, it is as follows:—Australasian Colonies, India, China, and Japan, 8s. 6d.; West Indies and Mauritius, 8s. 10d. Remittances may be made by Postal or Post Office Order, or by Cheque, and should be addressed to "The Asst. Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C." To all members who have previously paid their Annual Subscription, the Year-Book, including Transactions, is posted as soon as published in December, and to other members immediately after the publication of the Subscription.

Extra copies of the Year-Book and Transactions for 1870 and subsequent issues, will be sent to members on receipt of Subscription as above, for each additional copy. To non-members, the price is Ten Shillings per volume, exclusive of postage.

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ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1890, TO JUNE 30,

1891.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL
CONFERENCE

AT THE

TWENTY-EIGHTH ANNUAL MEETING

HELD AT

CARDIFF,

AUGUST, 1891.

LONDON:

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OF THE

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THE BRITISH PHARMACEUTICAL CONFERENCE.

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THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1892 will be held at Edinburgh.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretary, or any other officer or member. The yearly subscription is payable in advance, on July 1st. The amount, which includes free delivery of the Year-Book, is 7s. 6d. for members residing in any European country, Canada, or the United States of America. For those resident in other countries, if the Year-Book be mailed direct to members, it is as follows:—Australasian Colonies, 10s.; South Africa, India, China, and Japan, 9s. 6d.; West Indies and Mauritius, 8s. 10d. Further information may be obtained from

THE ASST. SECRETARY; BRIT. PHARM. CONF.,
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THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of about 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 319.

LIST OF CONTENTS.

	PAGE
Introduction	1
Chemistry	19
Materia Medica and Pharmacy	157
Notes and Formulæ	267
Bibliography	299
Constitution and Rules of the British Pharmaceutical Conference . .	319
Honorary Members of the Conference	320
Foreign and Colonial Members	321
Home Members	327
Societies and Associations invited to send Delegates to the Annual Meeting	353
Presentation Copies of the Year-Book, to whom forwarded . . .	355
List of Journals presented to the Conference	355
Transactions of the British Pharmaceutical Conference	317
General Index	513

INTRODUCTION.

IN a summary of the leading contents of this volume, such as we intend to give in its opening pages, we may fitly commence our observations with a brief sketch of the recent contributions to the chemistry of vegetable alkaloids, on account of the special interest attaching to this subject from a pharmaceutical point of view. It will be remembered that of late the investigation of these bodies has not been confined to the study of their constitution and properties and the discovery of new members of this group, but that the question has arisen whether some of the most important of their number, hitherto accepted without doubt as the chief active constituents of the respective medicinal drugs from which they are obtained, have any existence in the latter at all, or whether they are wholly or in part products of change formed in the process of their extraction and purification. This tendency to transformation, so strikingly illustrated in the case of the alkaloids of *Atropa belladonna*, obviously renders the isolation of pure active plant principles a task of increased difficulty and delicacy. Similar changes, moreover, as are observed in the chemist's laboratory, may also occur spontaneously in the drug on keeping, as well as in the living plant under the influence of age, cultivation, and other varying conditions. It is therefore not surprising that renewed efforts to ascertain the real nature of such bodies as the mydriatic bases pre-existing in the more important members of the *Solanaceae* should fail to show concordant results, notwithstanding the use of every precaution on the part of the various investigators to avoid alteration in the substances under examination. E. Schmidt and M. Schütte report that the alkaloid from *young* belladonna roots, collected at different seasons from wild plants, proved to consist entirely of hyoscyamine, whereas roots of not less than eight years of age were found to yield chiefly hyoscyamine, with a very small proportion of atropine. Much hyoscyamine and very little atropine were also detected by them in the leaves of uncultivated belladonna,

while the ripe fruit gave evidence of the presence of atropine only. The keeping of dried belladonna root, even for long periods, did not produce any change in the nature of the pre-existing alkaloid. In stramonium seeds hyoscyamine was found to be associated with small quantities of atropine and hyoscine. Of *Duboisia* leaves two specimens were examined, one of which contained chiefly hyoscyamine, the other only hyoscine. In *Solanum tuberosum*, *Solanum nigrum*, *Lycium barbarum*, and *Nicotiana tabacum* the same authors succeeded in recognising traces of mydriatic bases resembling those occurring in belladonna, but requiring further study for their identification. It will be observed that the foregoing results, with regard to the belladonna bases, are not in accord with the experience of O. Hesse, who found atropine to predominate in the leaves, and to be entirely absent in a specimen of old roots. In his opinion, the amount of atropine in belladonna is subject to great variations. A feature of special interest in his recent investigation of the root is the discovery of a new base, *atropamine*, possessing no mydriatic properties, and agreeing in its formula with pure belladonnine, but differing from the latter and all other belladonna alkaloids in forming readily crystallizable haloid salts. The ease with which it is converted by hydrochloric and other mineral acids into belladonnine, and subsequently into pseudotropine and an acid, may account for the fact that its existence has been hitherto overlooked. It should be added, however, that this new base does not appear to be a constant constituent of belladonna root, that its proportion in different samples of the wild root containing it varies considerably, and that it has not been observed in the roots of cultivated belladonna or in the leaves of either wild or cultivated plants. We conclude our references to solanaceous alkaloids by mentioning that solanine has been detected by M. E. Wotczal in no fewer than nine species of *Solanum*, and in three of *Scopolia*; and that the shoots thrown out by potatoes kept in the dark have been found by A. Jorissen and L. Grosjean to contain, in addition to solanine and solaneine, a base of the formula $C_{26}H_{41}NO_2$, identical in all respects with solanidine obtained from solanine.

Some interesting light has been thrown on the chemical relation between atropine and cocaine by A. Einhorn, who has obtained tropidine among the decomposition products formed from anhydroecgonine by the action of strong hydrochloric acid at high temperatures. He regards a suitable process for the formation of tropine from tropidine by the addition of the elements of water as the only

step now wanting for effecting the conversion of cocaine into atropine. Success in this direction is approached by A. Ladenburg's recent observation, that a small quantity of tropine is formed from tropidine on treating the latter with hydrobromic acid.

A new alkaloid, discovered in *Contum maculatum*, is reported upon by E. Merck and A. Ladenburg, and is described under the name *pseudoconhydrine* as a crystalline body isomeric with conhydrine, and, like the latter, belonging to the class of bodies termed alkines. It is contained in small quantities in the high boiling portions of crude coniine, from which it may be separated by fractional distillation *in vacuo*.

W. R. Dunstan and W. H. Ince have published the first of a series of contributions to the chemistry of the aconite bases, in which they deal chiefly with aconitine, the crystalline alkaloid of *Aconitum napellus*. Extracted from the root with amyl alcohol, and thoroughly purified, this body proved to have a composition corresponding to the formula $C_{33}H_{45}NO_{12}$, which differs from Wright and Luff's formula ($C_{33}H_{43}NO_{12}$) by two atoms of hydrogen. Contrary to the statements of previous observers, these chemists find aconitine to be dextro-rotatory, though the hydrobromide is lævo-rotatory. Their results with regard to the derivatives of aconitine confirm the existence of apoaconitine, $C_{33}H_{43}NO_{11}$, and aconine, $C_{26}H_{41}NO_{11}$, previously described by Wright and Luff. E. Richards and F. A. Rogers assign to aconitine a formula contrasting materially with those already referred to in the amount of nitrogen, while agreeing with the latter in the number of carbon, hydrogen, and oxygen atoms. They are inclined to assume the existence of two isomeric forms of aconitine, differing essentially in their degree of toxicity. From two varieties of Japanese aconite, presumably derived from *Aconitum chinense*, A. Lubbe and O. Lezius have isolated a crystallizable alkaloid identical with aconitine from *Aconitum napellus*.

Cytisine, the alkaloid obtained by Husemann and Marmé from the seeds of laburnum and other species of *Cytisus*, has been re-investigated by A. Partheil, whose results seem to leave little doubt as to the identity of this body with ulexine, the base prepared by A. W. Gerrard and W. H. Symons from the seeds of *Ulex europæus*. This conclusion confirms an opinion to the same effect already expressed by R. Kobert on physiological grounds. While ulexine is thus deprived of its claim to individuality, its formula, $C_{11}H_{14}N_2O$, is adopted for cytisine in the place of the one previously assigned to it.

A further addition to the number of known opium bases has been made by M. Kander's discovery of a new alkaloid occurring in the drug in even smaller quantities than protopine, and sharing with morphine and laudanine the property of being soluble in solution of soda. It is described under the name of *tritopine*, and is stated to crystallize in characteristic needle-like plates, fusing at 182° C., and having a composition represented by the formula $C_{42}H_{54}N_2O_7$. Protopine is now known to be not confined to opium, but to occur also in the roots of *Sanguinaria canadensis* and *Chelidonium majus*, in the former of which it is associated with chelerythrine, sanguinarine, and homochelidonine, and in the latter with chelidonine, chelerythrine, and homochelidonine. The perfect identity of specimens of protopine prepared from these three sources has been proved by G. König.

Laurotetanine, a new crystalline base giving very characteristic colour reactions, has been detected by M. Greshoff in a number of plants belonging to different genera of the *Laurineæ*. It is reported to be a powerful poison, acting like strychnine on the spinal cord, and, like the latter, producing tetanic spasms.

E. Grimaux and A. Arnaud have succeeded in effecting the transformation of cupreine into quinine, and have fully confirmed the inference drawn by O. Hesse from a comparison of the formulæ of the two alkaloids that the latter (quinine) may be regarded as the methyl ether of the former. By heating a solution of cupreine in methyl alcohol with sodium and an excess of methyl chloride in a sealed tube, they have obtained a base conforming to all the physical and chemical characteristics of quinine. In an essay on quinine, cinchonidine, and their isomers, O. Hesse refers to the differences between the two forms of anhydrous quinine, showing among other points of distinction that the melting point of the anhydride obtained by direct crystallization is 3° C. higher than that of the base obtained by heating the dry hydrate or the benzene compound. He regards ordinary quinine and the crystalline anhydride as different isomeric forms, and proposes to distinguish them by applying to the higher melting base the name homoquinine, a term formerly appropriated for another substance by Howard and Hodgkin, but now abandoned in that sense. He also deals with the relations between cinchonidine and homocinchonidine, giving a brief sketch of the history of this subject calculated to clear up the confusion met with in chemical literature respecting these two bases. M. Tarozyi calls attention to a compound of quinine and albumen prepared from sulphate of quinine and

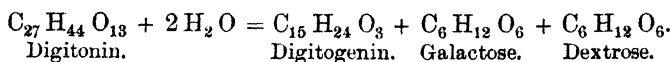
albuminate of soda by double decomposition, and possessing the property of not being decomposed by the strongest alkalies.

The conflicting statements of various observers as to the proportion of emetine occurring in ipecacuanha, and the comparative ignorance prevailing with regard to the other constituents of the drug, have induced R. A. Cripps and A. Whitby to submit the root to a general chemical analysis. Their results show that the total quantity of alkaloid extracted by various solvents amounted to 2.4 per cent., and that the other constituents consisted of saccharose, dextrose, dextrin, a very large percentage of starch, a trace of volatile oil, tannin, free fatty acid, neutral fat, various resins, mucilage, albumen, pectin, and a glucoside. The above yield of alkaloid did not appear to be entirely emetine, and a further research is to deal with the question as to the presence and nature of other bases contained in it. No allusion is made in the report to the volatile alkaloid obtained by E. M. Arndt from ipecacuanba a few years ago, and no special search seems to have been made for this body, which, if present, would easily escape detection in the course of analysis adopted. According to the latest information furnished by the last-named chemist respecting this volatile base, it is identical with choline, and occurs in the root in the form of a tannate insoluble in water, but soluble in acids. Choline has also recently been observed as one of the alkaloidal constituents of the seeds of *Vicia sativa* and *Pisum sativum* by E. Schulze; while E. Jahns has detected it in areca nut, in which it is associated with arecoline and arecaine, the bases previously recognised by him in this drug.

In a report on veratrine, F. B. Ahrens confirms Bossetti's observation that, upon treatment with alcoholic baryta solution, this alkaloid yields angelic acid and cevidine. He also corroborates Wright and Luff's statement that the action of alcoholic potash on veratrine results in the formation of tiglic acid and cevine, but finds that in this reaction angelic acid is first formed and is subsequently converted into tiglic acid. The alkaloids of *Veratrum album* have been successfully reinvestigated by G. Salzberger, whose results add two new crystallizable bases, *protoveratrine*, an extremely powerful poison, and *protoveratridine*, to the three already known, jervine, rubijervine, and pseudojervine.

The well-known researches of Schmiedeberg on the active principles of digitalis have indicated that commercial digitalin contains, in addition to digitoxin, its most important pharmacological constituent, the three glucosides, digitonin, digitalin, and

digitaleïn; and that another characteristic body, described by him under the name of digitogenin, is formed on heating with dilute hydrochloric acid. The nature of the reaction giving rise to the precipitation of digitogenin and the simultaneous production of substances reducing Fehling's solution has now been further investigated by H. Kiliani, who shows that the glucoside engaged in this particular change is digitonin, and that both galactose and dextrose are formed in the hydrolysis of the latter. The reaction is represented by him as occurring in accordance with the following equation :



Attention is called by L. Lambert to the great instability of diuretin, and to the ease with which it suffers partial decomposition on mere exposure to the carbonic acid of the atmosphere. According to M. Marette, this preparation cannot be regarded simply as a double salicylate of theobromine and sodium, but as a mixture of sodium salicylate with the strongly alkaline compound described by Würtz as "sodium-theobromine." Processes for the assay of diuretin are published by Eckenroth and G. Vulpus.

The commercial product termed piperazine, piperazidin, or Ladenburg's ethyleneimine (diethylenediimine), which has recently been introduced to the medical profession as "synthetical spermine," is found by A. W. v. Hofmann to be identical with diethylenediamine, obtained by him some time ago as the product of a reaction between ammonia and ethylene chloride. A direct comparison of this body with spermine, carried out by W. Majert and A. Schmidt, justifies the inference that, notwithstanding the great similarity between the two bases, they are not identical; and this conclusion is confirmed by A. Poehl's redetermination of the composition of pure spermine, showing the formula of this alkaloid to be $\text{C}_{10} \text{H}_{26} \text{N}_4$, which differs materially from that given by Schreiner.

One of the most interesting discoveries of the year, regarded from a purely chemical point of view, is the production of a compound of hydrogen and nitrogen corresponding to the formula HN_3 , and possessing properties strikingly analogous to those of the halogen acids, though differing from the latter in its great liability to explosion. This hydrogen nitride, or azoimide, as it has been termed, is obtained by a series of organic reactions, commencing with the formation of hippurylhydrazine; and though the various steps in the process of its preparation are such as, in

a treatise on chemistry, could only be properly discussed in the organic part of the work, the product itself, according to present definitions is unquestionably an inorganic body, thus affording another proof of the impossibility of drawing anything like a thoroughgoing distinction between the two great sections of chemical science.

The constituents of the artificial salicylic acid of commerce and their physiological action form the subject of a research carried out by W. R. Dunstan, O. F. C. Bloch, and M. Charteris, with the main object of throwing light on the difference often observed in the therapeutic effects of the artificial acid as compared with that of the pure natural acid obtained from oil of wintergreen. Their results show that the impurities in the commercial product and its sodium salt, which may account for this difference, consist of ortho-, para-, and meta-cresotic acids, of which the first is stated to be markedly toxic, the second less so, and the third innocuous. A process is also described by them for the purification of the commercial acid, as well as characters and tests to which the acid intended for medicinal use ought to respond. The statement as to the toxicity of paracresotic acid has been called in question as not in accord with the experience of other observers; but since, in a subsequent report, M. Charteris himself fixes the lethal dose of this body as high as three grains per pound of body weight, the difference of opinion on this point appears immaterial. The latter report further confirms the more poisonous characters of ortho-cresotic acid.

A new method for the purification of chloroform applicable also to a number of other liquids has been introduced by M. Pictet, and is reported to yield a product of a very high degree of purity, and free from all liability to change on keeping or prolonged exposure to light. It consists of a process of fractional crystallization at exceedingly low temperatures.

The carbohydrates continue to engage the close attention of persevering investigators. Some new synthetic sugars are described by E. Fischer and F. W. Passmore, who give an account of their progression from *d*-mannohexose, $C_6H_{12}O_6$, to *d*-mannononose, $C_9H_{18}O_9$, showing among other interesting features that the nonose is fermentable by yeast, while the heptose and octose are not. They point out as a fact of considerable physiological importance, that although sugars containing three, or a multiple of three, carbon atoms in the molecule are fermentable, those containing four, five, seven, and eight carbon atoms do not afford a suitable

pabulum for the ordinary yeast plant. The action of strong hydrochloric acid upon glucose has yielded to E. Fischer a new sugar similar in its constitution to maltose, and possibly identical with the sugar recently discovered by Scheibler and Mittelmeier in commercial dextrin. The characteristic sugar contained in the manna from *Eucalyptus gunnii* has been identified by F. W. Passmore as melitriose. Sorbite has been obtained as a reduction product from glucose by J. Meunier, and from fruit sugar by E. Fischer. The latter has also published a valuable survey of the results already obtained by himself and others in the investigation of the sugar group; and the same service has been performed with regard to starch and dextrin by C. Scheibler and H. Mittelmeier. A perusal of this work can hardly leave any doubt on the reader's mind that the synthetical production of such bodies as starch, cellulose, and other natural carbohydrates is only a question of time.

The very interesting observation made by A. Rommier a short time ago respecting the influence of yeast on the bouquet of wines is confirmed by G. Jacquemin. The same must, when fermented with yeast cultures obtained from various districts, is found to yield products having the characteristic bouquet of the wines of those districts.

E. Harnack supplies some additional information respecting the preparation and properties of pure egg albumen free from ash, and also discusses the part played by albumen in the animal economy. Dealing with the albuminoid constituents of milk, W. D. Halliburton arrives at the conclusion that caseinogen and lactalbumen are the only proteïds existing in this liquid. He applies the name caseinogen to the principal albuminoid in milk precipitable by saturation with certain neutral salts or by acetic acid, and considers that casein should in the classification of proteïds be grouped with fibrin, gluten, and other insoluble bodies of this kind formed by ferment activity from pre-existing soluble proteïds. A chemical theory of the coagulation of blood is suggested by M. Arthus and C. Pagès, whose experiments lead to the inference that, under the influence of the fibrin ferment, and *in the presence of calcium salts*, the fibrinogen of the blood plasma is decomposed into an insoluble calciferous compound (fibrin), and a soluble body (globulin) coagulating at 64° C. The observation that calcium salts are essential in the act of clotting, both in blood and milk, is corroborated by S. Ringer and H. Sainsbury. Sodium and potassium salts, on the other hand, are found to have a restraining

influence on coagulation. R. Lépine and M. Barral confirm the existence in the blood, and especially in the chyle, of a glycolytic ferment possessing the power of destroying glucose. It is said to be excreted chiefly from the pancreas, and to disappear in the blood of patients suffering from diabetes. The question as to what becomes of the sulphur of proteïds during pancreatic digestion seems to meet with an explanation from an observation by E. Külz that cystin was found among the products of this digestion; but it remains to be shown whether its formation under such circumstances is of normal occurrence. J. M. Clarke has studied the disturbing action of hydronaphthol on digestion, and finds that this body has a distinct retarding influence on the digestion of egg albumen by peptic fluids, a very slight effect on the peptic digestion of milk, and no action whatever on the pancreatic digestion of milk or albumen, nor on the conversion of starch into sugar.

A comparison of the various tests for the detection of albumen in urine leads A. Jolles to the conclusion that the reaction with potassium ferrocyanide in the presence of acetic acid affords the most delicate indications, enabling the operator to detect as little as 0.0008 per cent. As a new though somewhat less delicate test for this purpose, the same author recommends the careful addition of a few drops of saturated solution of bleaching powder to a mixture of equal volumes of strong hydrochloric acid and the urine under examination. The production under these circumstances of a white turbidity on the surface of the liquid is stated to be characteristic of albumen. A volumetric process for the estimation of this substance, suggested by F. Venturoli, is based on the fact that mercuric chloride precipitates the whole of the albumen from urine acidified with acetic acid, before combining with potassium iodide. For the determination of sugar in urine, H. Ost recommends the abandonment of Fehling's solution in favour of a reagent prepared by gradually adding a solution of 23.5 grams of crystallized copper sulphate to a solution of 250 grams of potassium carbonate and 100 grams of potassium bicarbonate, and making up to one litre. U. Haussmann, on the other hand, advocates the rejection of all methods based on the reduction of copper or bismuth salts, and the adoption of the fermentation process, which he finds to give more trustworthy results both for quantitative and qualitative purposes. Of the various tests for the detection of bile pigments in urine, A. Jolles prefers those of Rosenbach and Huppert, while S. Kathrein recommends the application of tincture of iodine for this purpose. The amount of uric acid in urine is

determined by W. Camerer by estimating the nitrogen in the precipitate produced by this acid with silver nitrate. A new method for the titration of chlorine in urine is described by A. Corvi, and consists in the complete precipitation of this constituent from the slightly acidified urine with a measured quantity of decinormal silver nitrate solution, and the determination of the excess of silver in the filtrate by means of a decinormal solution of potassium ferrocyanide, ferric sulphate being used as an indicator. The occasional occurrence of hæmatoporphyrin in urine is confirmed by E. Salkowski, who attributes this phenomenon to the administration of sulphonal to the patient. The statement that the medicinal administration of Peruvian balsam, balsam of Tolu, storax, or benzoin, is liable to be followed by albuminuria, is disproved by R. Stockman, who finds that the precipitate formed in the urine of such patients by nitric acid is not albumen, but consists of the resinous constituents of the balsam administered. F. Moritz and W. Prausnitz record the interesting observation that diabetes can be temporarily induced by the administration of the glucoside known as phloridzin, and that the amount of sugar found in the urine under such circumstances far exceeds that accounted for by the phlorose derived from the glucoside itself. Possibly this drug possesses the power of arresting the action of the glycolytic ferment already referred to in this chapter.

In reply to some adverse criticism respecting the mercuric test for mydriatic alkaloids, A. W. Gerrard reasserts the value of this reaction when applied to hyoscyamine, but admits that it is not applicable to hyoscine. This being so, he regards the test as an easy means of distinguishing hyoscine from other mydriatic bases. Processes for the detection of atropine, coniine, and coca bases in forensic investigations are published by F. Ciotto and P. Spica, L. W. Andrews, and U. Mussi respectively. Referring to the estimation of caffeine in tea, B. H. Paul points out that, notwithstanding the greater solubility of this alkaloid in chloroform, it is not possible to substitute this solvent for alcohol, as under such circumstances the lime retains a not inconsiderable portion of the base. A further series of analyses of different kinds of tea by the same author in conjunction with A. J. Cownley confirms the correctness of their previous conclusion, that the amount of alkaloid in tea is greater than had been assumed, and that it does not stand in any constant or definite relation to the price of the tea. For the estimation of tannin in tea, P. Maltscheffsky suggests its precipitation with normal solution of copper

acetate, and the titration of the excess of copper in the filtrate by means of potassium ferrocyanide. The iodine absorption of tannin serves as the basis of a volumetric process described by A. Moulade for the assay of this substance in general. Attention is called by H. Will and also by B. Jaffé to certain defects in the official test of the German Pharmacopœia for the purity of glycerine and to the precautions necessary in its application. N. E. and C. Deiss and L. J. Spencer recommend new methods for the estimation of glycerine in commercial preparations. The action of iodine on alkaline solutions of phenols is turned to account for the purpose of a volumetric assay of the latter by J. Messinger and G. Vortmann. A comparison of some of the processes in use for the determination of organic nitrogen, carried out by R. W. Oddy and J. B. Cohen, leads to the conclusion that in comparison with the process of Dumas, that of Kjeldahl gives satisfactory results in the case of the more readily decomposed organic compounds, while the results obtained by Wanklyn's method are much too low. M. Rosenfeld shows that, under certain conditions, the reaction of nitric acid with pyrogallol affords a very delicate means for the detection and approximate estimation of this acid in potable waters. For the same purpose a colour reaction with sulphuric acid and sodium salicylate is suggested by G. Loeff, and another with α -naphthylamine and sulphuric acid, after previous reduction of the nitric to nitrous acid, by G. Harrow. Accounts of numerous other analytical methods, extending to a great variety of substances, will also be found in this volume.

The observation that pomegranate root-bark, when kept for some length of time, loses much of its physiological activity and may even become totally inert, has induced E. Aweng to investigate the cause of this deterioration. He finds that the alkaloidal constituents, which at first are freely soluble, become gradually less so, and are therefore yielded with difficulty and very imperfectly to water and alcohol by the older samples of the bark. Subsequently these principles undergo decomposition, and finally disappear altogether. This view, however, is not shared by J. E. de Vrij, who reports that some of the bark which he had brought from Java and kept in a tin box for eleven years proved very active in every instance. With regard to the three different kinds of *Punica granatum* growing wild in Java, this author agrees with M. Stoeder that the white-flowering variety is the most active.

Some time ago F. A. Flückiger directed attention to the falling off in the quality of jalap root now imported as compared with

that of former periods, and suggested as an explanation that the Mexican dealers extract part of the resin from the roots by treatment with alcohol. Similar observations are now recorded by J. P. Suess, who arrives at the conclusion that the maintenance of the pharmacopœia standard respecting the proportion of resinous constituents of this drug is no longer practicable.

J. B. Nagelvoort has determined the amount of oleo-resin and filicic acid in samples of the rhizome of *Aspidium felix mas* collected at different periods. His results show considerable variations in the strength of this drug, and indicate the largest percentage of oleo-resin in the samples collected in February. The variations of this constituent, however, do not appear to be at all proportional to those of the filicic acid.

A. W. Gerrard has continued his researches on the alkaloidal value of commercial henbanes, and has now extended them also to samples imported from France and Germany. His results are described in a paper read before the recent meeting of the British Pharmaceutical Conference. The seeds of henbane have been examined by F. Ransom, who does not think that they can be advantageously used for galenical preparations.

In another contribution to the British Pharmaceutical Conference, E. M. Holmes argues in favour of greater attention being paid in India to the production of a medicinal opium capable of competing in appearance and strength with Turkey opium in the British and colonial markets. He regards the hilly districts of India as suitable localities for producing an opium containing a sufficient proportion of morphine to answer the requirements of the British pharmacopœia. Dealing with Indian gums, Dr. Rideal and W. E. Youle refer particularly to the properties of ghatti gum and its suitability as a substitute for gum arabic for pharmaceutical work. Additional information respecting Australian gums is furnished by J. H. Maiden. Among the latter those yielded by species of *Ceratopetalum* are stated to form a characteristic group occupying an intermediate position between the kinos and metarabic gums. The gum of the leopard tree, *Flindersia maculosa*, is stated to yield a good adhesive mucilage, and to be used by bushmen as a remedy for diarrhœa. A gum from two species of *Macrozamia* alluded to in the same report is shown to consist principally of metarabin, and to have little chance of gaining any commercial importance. The resins of various species of *Xanthorrhœa* are described by the same author under the name of "grass-tree gum." E. M. Holmes has endeavoured to clear up

the origin of the different varieties of galbanum, and arrives at the conclusion that the so-called "Levant" galbanum is probably derived from *Ferula galbaniflua*, and the solid "Persian" drug, differing from the former by its somewhat turpentine-like odour, possibly from *Ferula Schair*. The liquid Persian galbanum is referred by him to a species nearly allied to *Ferula galbaniflua*. The same author, supported by J. Bainbridge, supplies evidence that "Natal" aloes, sometimes also known in commerce as "Hepatic" Cape aloes, is most probably the product of *Aloe succotrina*, and that a specimen of aloes from plants grown near Port Elizabeth is derived from *Aloe platylepis*. Curaçoa aloes is stated to be the produce of *Aloe chinensis*, a species whose history and relation to *Aloe barbadensis* seems to require further elucidation.

E. M. Holmes has also given his attention to the arrow poison used by the pigmy race in Central Africa, and has succeeded in identifying the various drugs of which it is composed as species of *Erythrophlœum*, *Palisota*, *Combretum*, *Strychnos*, and *Tephrosia*, thus showing that the chief active ingredients in this poison are erythrophlœine and strychnine. In connexion with arrow poisons we may also allude to an observation respecting curare recently made by J. Tillie, showing that curarine and curine differ essentially in their physiological action, and that the variable action of different samples of curare is due to differences in the relative proportion of these two alkaloids.

A Persian drug imported into Bombay under a name signifying "sweet pellitory," is reported upon by D. Hooper, and appears to be the root of *Tanacetum umbelliferum*. It is said to enjoy a reputation among the natives as a tonic, alterative and anthelmintic, and to be also useful in rheumatism, gout, and in enlargement of the liver and spleen. *Hieracium scouleri*, a native plant of Oregon and Montana, is stated by F. D. Kelsey to be successfully used in that region as a cure for the bite of the rattlesnake. The rhizome of *Aletris farinosa* is found to act as a bitter tonic when administered in small doses, but as a cathartic and emetic if given in larger quantities. The inner white bark of the European elder, *Sambucus nigra*, is recommended by G. Lemoine as a valuable and efficient diuretic, exercising also a slight laxative action. The bark of *Chrysophyllum glycyphlœum* is spoken of by P. G. Rozanoff as a useful expectorant and astringent. G. Sée reports very favourably on the value of *Cannabis indica* as a remedy for the relief of various forms of dyspepsia. The action of *Randia dumetorum* as a nervine calmative and anti-spasmodic is referred

to by J. Sawyer, who attributes these properties to the saponin and valeric acid contained in it. W. Murrell discusses the valuable laxative properties of guaiacum resin, which hitherto seem to have received but little attention. The purgative action of castor oil is shown by H. Meyer to be solely due to the ricinoleic acid existing in it as a glyceride.

A false spigelia recently offered for sale in London is described by H. G. Greenish, and shown to be the root of *Phlox carolina*, which is met with as a substitute for true spigelia in the United States. The adulteration of mace with Bombay mace and other vegetable materials (leguminous fruits, etc.) coloured with turmeric is referred to by M. Hefelmann. The various adulterations of saffron and their mode of detection forms the subject of a report by F. F. Riches and J. Dunning. The past year's contributions to the literature of drug adulteration also comprise notices of honey, wax, lard, cod liver oil, castor oil, olive oil, and the oils of turpentine, bergamot, peppermint, cassia, and bitter almonds.

R. H. Davies and T. H. Pearmain record the results of a number of experiments upon the chemical and physical properties of a series of essential oils from different species of *Eucalyptus*, showing that the relative value of such oils, as far as this depends on the proportion of eucalyptol may be deduced from their action on polarized light. They also show that the oil of *Eucalyptus amygdalina*, which is comparatively poor in eucalyptol, is the only one giving indications of phellandrene with the nitrous acid test. The same subject is also dealt with by P. W. Squire. The so-called eucalyptus honey of commerce is shown by T. P. A. Stuart and J. H. Maiden to be a mere mixture of ordinary honey with a small quantity of oil of eucalyptus. In genuine eucalyptus honey, on the other hand, F. W. Passmore has proved the presence of eucalyptus manna by determining the chemical nature of the sugars present in it.

R. Kobert has conducted clinical experiments with the various constituents of ergot claimed as active principles, and arrives at the conclusion that of these cornutine is the most active. He also criticises the various official and popular preparations of ergot, and considers all those in which water is used for extraction as unsatisfactory and liable to change. In his opinion, alcohol only should be employed as a menstruum, while the ergot should not be more than twelve months old, and should be freshly powdered and freed from oil by means of petroleum ether before being extracted with the spirit.

Styracol, the cinnamic ether of guaiacol, is introduced to the notice of the medical profession as a useful remedy in phthisis. When taken internally it is decomposed into cinnamic acid and guaiacol, to the latter of which it owes its therapeutic properties. Benzosol, another derivative of guaiacol, is suggested as similar in its action, and is stated to have the advantage of being slowly saponified by the gastric juice, and thus to liberate the guaiacol under conditions minimising its local irritation. The value of agaric acid for the relief of night sweats in phthisis, to which attention has been called by Hofmeister, is confirmed by M. Combemale, who likewise recommends sodium tellurate for the same purpose. Cetrarin, the bitter principle of Iceland moss, is found by R. Kobert to prove beneficial in chronic constipation, and also to act as a valuable blood tonic in cases of anæmia. Lusini has studied the physiological properties of thialdine and carbothialdine, and reports that the latter has a powerful action as a tetanising agent, while the former produces paralysing effects. Methyl-strychnine is stated by J. Tillie to resemble curarine rather than strychnine in the relative order and strength of its paralysing and tetanising action. The opium bases and their derivatives are dealt with from a physiological point of view by R. Stockman and D. B. Dott, and likewise by W. Murrell; and a similar service is rendered with regard to the cocaine group by P. Ehrlich, E. Poulsson, and U. Mosso.

A preparation, described under the name of *hydrochlorate of phenocoll*, is another addition to the group of antipyretic and anti-rheumatic compounds. It is the hydrochlorate of a substance represented as phenacetin into the acetyl radicle of which an amide group is introduced. *Iodophenin*, an iodine derivative of phenacetin, is recommended both as a febrifuge and an antiseptic, while *iodoantipyrine* is stated to combine the effects of antipyrine with those of iodides. The name *resopyrine* is applied to a compound of resorcin with antipyrine. Another antipyretic, referred to as "euphorin," proves to be phenyl-urethane under a new name. Methylphenacetin is introduced as a new narcotic. Among new antiseptics, discussed in this volume, may be mentioned *apyonin*, a substance of the methyl-violet class; *antiseptol*, or iodosulphate of cinchonine; and *microidine*, which is said to be mainly an impure naphthalate of soda.

The solvent action of alcohol of different degrees of strength on some of the drugs used in making pharmacopœial tinctures has been investigated by E. H. Farr and R. Wright, who, on the

strength of their results, recommend alcohol of about 70 per cent. for the tinctures of conium and aconite, and a menstruum of 50 per cent. alcohol in the case of the tinctures of colchicum and henbane, as the most suitable strength for effecting complete extraction of the active principles. They also suggest the advisability of standardizing these tinctures. Commercial specimens of tincture of nux vomica are shown by A. J. Dey to be still far from equal in strength, and suggestions are therefore made by him for insuring greater uniformity. Proposals in the same direction with regard to the extracts of nux vomica and opium are made by M. Conroy in a paper read at the recent meeting of the Conference. The standardizing of extract of belladonna is advocated by W. B. Cowie. A process for the approximate estimation of alcohol in tinctures is described by J. F. Liverseege, while a method for determining the proportion of volatile oil in copaiba forms the subject of a report by R. A. Cripps. A. H. Allen deals with the assay of aconite preparations, by means of a process depending upon the formation of benzoic acid in the saponification of aconitine. J. Moss calls attention to the loss of active constituents during evaporation in the preparation of the official extract of cascara sagrada, and shows that the use of proof spirit as a menstruum instead of water yields a superior and more active extract. An improved method for the preparation of liquid extract of cinchona, based on suggestions by de Vrij, is recommended by M. C. Traub. F. Lascar confirms Brocker's observation that infusion of digitalis, made from leaves devoid of midrib and stalks, is much more active than one made from the entire leaves. Such a preparation, according to Forcka, also possesses much more stability. The great variation in the strength of vinum ferri, B.P., induces J. A. Forret to suggest that this preparation be entirely replaced by vinum ferri citratis. Pill excipients and pill coating are discussed in papers published by J. Findlay and D. H. Davies respectively. Suggestions of improvements in the preparation of liquor bismuthi, liquor hydrargyri perchloridi, mistura olei ricini, and solutio albuminis will also be found in this volume.

CHEMISTRY,

YEAR-BOOK OF PHARMACY.

PART I.

CHEMISTRY.

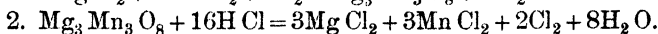
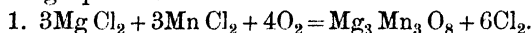
Hydrogen Nitride (Azoimide). T. Curtius. (*Ber. der deutsch. chem. Ges.*, xxiii. 3023-3033.) The author reports the interesting discovery of an acid containing only the two elements hydrogen and nitrogen, and corresponding to the formula HN_3 . Its structural

formula is represented as $\text{HN} \begin{smallmatrix} \swarrow \text{N} \\ \parallel \\ \searrow \text{N} \end{smallmatrix}$. It is a colourless gas, possess-

ing a very pungent odour, reddening blue litmus paper, and dissolving freely in water. In these and some other respects it is strikingly analogous to the halogen acids. With ammonia it forms white fumes of NH_4N_3 . Metals dissolve in it with evolution of hydrogen. The mercurous and silver salts are insoluble in water and highly explosive. The acid is obtained by a series of organic reactions, which may be summarized as follows: By the action of hydrazine hydrate on an alcoholic solution of ethyl hippurate, *hippurylhydrazine*, $\text{NH Bz} \cdot \text{CH}_2 \cdot \text{CO} \cdot \text{NH} \cdot \text{NH}_2$, is formed, which, by the action of nitrous acid, is converted into *nitrosohydrazine hippuric acid*, $\text{NO} \cdot \text{NH} \cdot \text{N} : \text{C Ph} \cdot \text{NH} \cdot \text{CH}_2 \cdot \text{COOH}$. The latter body splits up into hippuric acid and azoimide by treatment with a solution of caustic soda. If the resulting solution of the sodium compound of azoimide be boiled with dilute sulphuric acid, the azoimide distils over with the steam, and may then be converted into the silver salt by precipitation with silver nitrate. By decomposing the washed and dried precipitate with dilute sulphuric acid, and repeating this process several times, a solution can be obtained containing 27 per cent. of the gas.

Hydrogen Nitride (Azoimide). T. Curtius and R. Radenhausen. (*Journ. prakt. Chem.* [2], xliii. 207, 208.) The solution of hydrogen nitride (azoimide) obtained in the manner described in the preceding abstract may be concentrated by repeated fractional distillation until a product is obtained distilling at 45° C. This contains 91 per cent. of the anhydrous compound, and can be completely dehydrated by means of fused calcium chloride. At a low temperature pure hydrogen nitride is a clear, colourless liquid having a strong pungent odour, and boiling at 37° C. It is soluble in water and alcohol. Its vapour density could not be determined, owing to its great liability to explosion.

Preparation of Chlorine for Technical Purposes. A. Reychler and de Wilde. (*Chem. Zeit., Rep.*, August 30, 238.) On heating a mixture of equal molecular weights of the chlorides of manganese and magnesium at about 525° C. in a current of dry air, magnesium manganite is formed, whilst the whole of the chlorine is liberated. If afterwards a current of hydrochloric acid gas be passed over the residual manganite at about 425°, a further supply of chlorine is obtained, and the original chlorides are reproduced. These changes occur in accordance with the following equations:



Although, theoretically, the whole of the chlorine is thus liberated, it is found in practice that the actual quantity obtained amounts to about 70 per cent. of the hydrochloric acid employed. The mixture of the chlorides is rendered more consistent and infusible by the addition of magnesium sulphate.

A Reaction of Carbonic Oxide. M. Berthelot. (*Comptes rendus*, March 23, 1891.) A solution of ammonio-silver nitrate turns brown on the introduction of a few bubbles of carbonic oxide, and produces an abundant black precipitate upon subsequent boiling.

Preparation of Pure Phosphoric Acid. M. Nicolas. (*Comptes rendus*, cxi. 974, 975.) The author's process consists in the decomposition of powdered calcium phosphate by means of diluted hydrofluoric acid, and the subsequent removal of the excess of the latter by careful application of heat.

Action of High Temperatures on Sodium Carbonate. R. Kissling. (*Zeit. Ang. Chem.*, 1890, 262, 263.) The author has repeated his former experiments with the purest specimens of sodium carbonate. 100 parts of this salt, dried at 150° C. before

weighing, lost during the heat of fusion from 0.7 to 1.05 parts. In each experiment sodium oxide could be detected after ignition, though there was no trace of this present before ignition. The author is therefore of opinion, that in standardizing an acid with ignited sodium carbonate, perfectly accurate results cannot be obtained. For the detection of traces of alkaline hydrates or oxides the author makes use of Dobbin's reagent, which is prepared in the following manner: A solution of mercuric chloride is gradually added to a solution of about 5 grams of potassium iodide until a permanent precipitate begins to form. The latter is removed by filtration, and the filtrate mixed with 1 gram of ammonium chloride, and just sufficient of a weak solution of sodium hydrate until once more a permanent precipitate is produced. The filtered liquid is made up to 1 litre. This reagent forms a yellow coloration on the addition of the smallest trace of an alkaline hydrate.

Reduction of Alkaline Sulphates by Carbon. M. Berthelot. (*Comptes rendus*, cx. 1106-1112.) When alkaline sulphates are heated to bright redness in a current of carbonic oxide, they are completely reduced to sulphides, the carbonic oxide being converted into carbonic anhydride. The same reduction takes place on heating a mixture of dry alkaline sulphate with pure carbon in the presence of air, though in this case the carbonic anhydride evolved may be partly reduced to carbonic oxide by the excess of carbon. But in the complete absence of oxygen or air, little or no reduction of the sulphate is effected by the carbon. The author shows that the presence of a small quantity of carbonic oxide at the outset is essential to this reduction; and this is furnished by the oxygen of the air in the vessel, the oxygen in the carbon, or the oxides present in the material of the vessel. As soon as the reduction has commenced, the supply of carbonic oxide is kept up by the reducing action of the carbon on the carbonic anhydride evolved. The failure of carbon to produce a direct reducing action is attributed to the constitution of its molecules, which necessitate its conversion into a normal compound containing but one carbon-atom in the molecule before it can exercise its reducing power.

Catalytic Decomposition of Ammonium Nitrite. O. Loew. (*Ber. der deutsch. chem. Ges.*, xxiii. 3018, 3019.) The addition of platinum black to a weak solution of ammonium nitrite causes the immediate evolution of a gas, which at the beginning of the process consists of a mixture of nitrogen and nitrous oxide, but subsequently of pure nitrogen only.

Formation of Nitrous Acid and Ammonia from Free Nitrogen.

O. Loew. (*Ber. der deutsch. chem. Ges.*, xxiii. 1443-1447. From *Journ. Chem. Soc.*) When dry platinum black, from which water dissolves neither nitrous acid nor ammonia, is shaken with soda, both nitrous acid and ammonia are formed; if the soda is very dilute, the reactions of nitrous acid are obtained, but not those of ammonia.

The platinum black employed was most carefully prepared from platinic chloride free from nitric oxide, and the experiments were carried out in a room in which no fire or gas was burning, every precaution being taken to prevent contamination with nitrogenous compounds; the result was, however, always the same.

It would seem then that under the influence of the platinum black two processes take place: (1) The small quantity of nitrogen, condensed together with the oxygen in the platinum black, is directly oxidized to nitric oxide, which is then rapidly converted into nitrous acid. (2) When concentrated soda is employed, the nitrogen enters into reaction with the water as well, and ammonium nitrite is produced.

If air, purified by passing through concentrated sulphuric acid, concentrated potash, and several wash-bottles containing water, is conducted through a flask containing freshly prepared platinum black and a 0.5 per cent. solution (300 grams) of potash, the coloration produced with sulphanilic acid and α -naphthylamine, after acidifying with hydrochloric acid, is four times as intense after twelve hours as it was shortly after the commencement of the experiment, and the last wash-bottle does not contain a trace of nitrous acid. Large quantities of nitrite cannot, however, be obtained in this way, as the platinum black forms a compact layer at the bottom of the flask; better results would probably be obtained if the platinum black were allowed to condense a large volume of oxygen, containing nitrogen, by previous drying in the air.

A quantity of freshly prepared moist platinum black, corresponding to 23-24 grams of the dry substance, was mixed with about 5 grams of crystalline barium hydrate, both substances being perfectly free from nitrous acid and ammonia, the mixture quickly washed on to a filter, kept for two days in a desiccator over calcium chloride, and then washed with water (150 c.c.); the filtered washings gave a deep yellow colour with Nessler's reagent, and the total quantity of nitrous acid produced, estimated colorimetrically with Griess' reagent, was found to be about 0.7 milligram.

If active platinum black is treated with alcohol and then with chloroform, and finally placed in a desiccator over sulphuric acid for a day, it completely loses its power of causing the formation of nitrous acid and ammonia when it is shaken with air and soda, probably owing to the formation of a thin coating of platinum dichloride.

The fact that platinum at a high temperature causes the combination of oxygen and nitrogen has been lately observed by Illosva. This action commences at 180° with platinum black, at 250° with platinum sponge, and at 280° with platinum foil; but after prolonged heating at 300° the metal loses its activity.

Hyposulphites. A. Fock and K. Klüss. (*Ber. der deutsch. chem. Ges.*, xxiii. 1753-1764.) The compounds described in this paper are double salts, consisting of cadmium hyposulphite and the hyposulphites of potassium, sodium, ammonium, barium, and strontium. For particulars reference should be made to the original article.

Relative Basicity of the Hydrated Sesquioxides of Iron and Aluminium. E. A. Schneider. (*Liebig's Annalen*, cclvii. 359-380.) Ferric hydrate is freely soluble in solutions of the ordinary aluminium salts. By suitable treatment with a solution of aluminium chloride or nitrate it can be readily converted into a colloidal modification soluble in water.

The author upholds the view that ferric hydrate is a stronger base than the hydrate of aluminium, and considers that this view is in nowise disproved by the fact that the whole of the iron is precipitated as basic salt when a solution of ferric sulphate is boiled with aluminium hydrate. The latter, in this case, simply acts by neutralizing a portion of the sulphuric acid liberated by the dissociation of the iron salt.

The Decomposition of Silver Chloride by Light. A. Richardson. (*Proc. Chem. Soc.*, No. 97.) The author describes experiments made with a view to determine whether silver chloride which has been darkened by exposure to light under water contains oxygen. The nature of the change which occurs during decomposition of the chloride was also studied with reference to the part played by water.

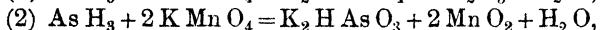
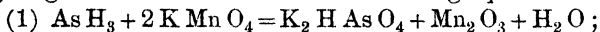
The results show the absence of an oxygen compound in the darkened product. The darkening of the carefully dried chloride was also observed to take place when exposed to light in a tube containing dry carbon tetrachloride from which all air had been removed by boiling. From these facts the author concludes that

the darkened silver compound is of the nature of a subchloride rather than an oxychloride.

Crystalline Mercuric Oxychloride. J. Volhard. (*Liebig's Annalen*, vol. cclv., Parts 1 and 2.) The oxychloride, $\text{Hg}_3 \text{O}_2 \text{Cl}_2$, is easily obtained by allowing a cold saturated solution of mercuric chloride, mixed with sodium acetate, to stand for some days, when the salt crystallizes.

New Double Chromates. A. Lachaud and C. Lepierre. (*Comptes rendus*, cx. 1035-1038.) The author describes a basic lead chromate, of the formula $\text{PbCrO}_4, \text{PbO}$; a double chromate of lead and potassium, $\text{PbCrO}_4, \text{K}_2\text{CrO}_4$; and another compound of the composition $\text{PbCrO}_4, \text{K}_2\text{CrO}_4, 2\text{PbO}$; also several salts corresponding to the last two, but containing sodium or lithium in the place of the potassium. For particulars the original paper should be consulted.

Action of Arseniuretted Hydrogen on Potassium Permanganate. D. Tivoli. (*Gazzetta Chim. Ital.*, xix. 630-632.) A dilute solution of potassium permanganate is acted upon by arseniuretted hydrogen in accordance with the following equations:



of which the first represents the principal reaction. The precipitated manganese sesquioxide contains variable proportions of the hydrated peroxide, and always carries down with it some of the potassium arsenate mechanically.

Action of Hydrogen Peroxide on Oxygen Compounds of Manganese. A. Gorgeu. (*Comptes rendus*, cx. 857-859; *Journ. Chem. Soc.*, 1890, 946.) The author shows that the exact nature of the change produced in this action varies with the conditions. Pure crystallized manganese peroxide, obtained by heating manganous nitrate at 158° - 170° , decomposes hydrogen peroxide comparatively slowly; and if the latter is slightly alkaline, the manganese peroxide undergoes no change at all. If, however, the hydrogen peroxide is slightly acid, the proportion of peroxide in the manganese compound may be reduced by several per cents. Hydrated manganese peroxide prepared in the cold immediately decomposes hydrogen peroxide, and the former also undergoes profound alteration to an extent depending on the proportion of the hydrogen peroxide. It follows that in the estimation of hydrogen peroxide, hydrated manganese peroxide should not be used; and even with the anhydrous manganese compound, there is risk of error unless the hydrogen peroxide is slightly alkaline.

The limit at which hydrogen peroxide has no action on manganese peroxide is represented by the basic manganite MnO_2 , 2MnO , $\frac{1}{4}\text{H}_2\text{O}$, which can be obtained by the prolonged action of a current of air on manganese hydrate suspended in its own mother liquor. Since hydrogen peroxide reduces only the oxides above this limit, it would seem that the oxidizing action of the peroxide on manganous hydrate ought to cease at the same point. This, however, is not the case; the manganous hydrate can be oxidized even to a higher degree than the acid manganite MnO_2 , MnO . The decomposition of hydrogen peroxide is more rapid in presence of a strong base, and the oxidation of the manganese is at first partly determined by the influence of the basic function of the manganous hydrate, assisted afterwards by the acid function of the peroxide which is formed. The higher oxidation may be regarded as due to the action of nascent oxygen.

Action of Metals on Sulphuric Acid. A. Ditte. (*Ann. Chim. Phys.* [6], xix. 68-92. From *Journ. Chem. Soc.*) The author has investigated the action of a number of metals on sulphuric acid of different degrees of concentration and at various temperatures; the following general conclusions may be drawn from the results of the experiments:

The metals attacked by sulphuric acid can be classed in two groups.

The one contains those metals which are acted on only when the acid is concentrated and hot; the reaction is very regular in all cases, and sulphurous anhydride alone is evolved, no secondary reactions taking place. To this class belong silver, mercury, copper, lead, and bismuth.

The second group embraces those metals which are acted on more or less readily by sulphuric acid of all degrees of concentration. The most constant product of the reaction is hydrogen, this gas being always evolved in the cold, and almost always at a high temperature also; when the temperature is not very high, hydrogen is the sole gaseous product, whatever the degree of concentration of the sulphuric acid employed. Sulphurous anhydride is only produced when the acid is hot and concentrated; the temperature at which the evolution of sulphurous anhydride commences varies with the metal employed, and, generally speaking, its quantity increases in proportion to the rise of temperature, the quantity of hydrogen decreasing to a proportionate extent, and sometimes, when the temperature is very high, disappearing altogether. When the concentration of the sulphuric acid decreases,

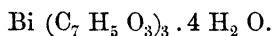
the formation of sulphurous anhydride also decreases, so that, even at a high temperature, it is not obtained free from hydrogen; when a certain degree of dilution of the acid is reached, sulphurous anhydride ceases to be formed. Between certain limits of temperature and concentration, which vary with the nature of the metal employed, the action of sulphuric acid gives rise to a mixture of hydrogen and sulphurous anhydride, so that by choosing a suitable temperature and an acid of suitable strength, a mixture of the two gases in any required proportion could be obtained.

This is true in the case of metals, like magnesium, which only yield hydrogen when treated with sulphurous acid, as the reducing action of the hydrogen on the sulphurous acid under the conditions of the experiment may be neglected. When, however, the metal employed decomposes sulphurous acid, yielding a sulphide, secondary reactions set in, and hydrogen sulphide is formed; in such cases, larger or smaller quantities of this gas are formed according as the action of the metal on the sulphurous acid is rapid or slow, and according as the sulphide produced is readily or slowly acted on by the sulphuric acid. The hydrogen sulphide thus produced decomposes, and is itself decomposed by, some of the sulphurous acid, and it also reduces the sulphuric acid, causing a deposition of sulphur, which, in its turn, acts on the sulphuric acid. When, however, the metal is treated with sulphuric acid under such conditions that sulphurous acid is not produced, the formation of hydrogen sulphide and other secondary reactions cease, and pure hydrogen is evolved. To the second of these two groups belong magnesium, manganese, nickel, cobalt, iron, zinc, cadmium, aluminium, tin, thallium, and probably also the alkali metals. In the case of the last named, it was only possible to study the behaviour with sulphuric acid in the cold, and under these conditions hydrogen is evolved; but, considering the close relationship between the alkaline metals and thallium, it is very probable that, like the latter, they would yield sulphurous anhydride on treatment with sulphuric acid at a high temperature.

Bismuth Potassium Iodides. C. Astre. (*Comptes rendus*, cx. 1137-1139.) The author describes three crystallized double salts obtained by treating bismuth iodide with different proportions of potassium iodide. Their composition is represented by the formulæ, $\text{Bi I}_3, 2 \text{ K I}$; $2 \text{ Bi I}_3, 3 \text{ K I} + 2 \text{ H}_2\text{O}$; and $\text{Bi I}_3, 3 \text{ K I}$.

Bismuth Salicylate. H. Causse. (*Comptes rendus*, May 25, 1220; *Pharm. Journ.*, 3rd series, xxi. 1169.) To obtain a salicylate of bismuth of normal composition, it is necessary to operate

in a chemically neutral liquid, and to avoid the dissociating action of water upon the bismuth salt. In experimenting to accomplish this end, the author has made the observation that certain ammonium salts, and especially the chloride, are antagonistic to the dissociating action of water upon a salt of bismuth, and can advantageously replace the acid added to maintain the salt in solution. Applying his observation, the author prepares a neutral salicylate of bismuth by dissolving 100 grams of subnitrate of bismuth with the aid of heat in concentrated hydrochloric acid, and after the liquid has stood until clear, adding to it a litre of solution of pure chloride of ammonium saturated at the ordinary temperature. In order to get rid of the free acid more subnitrate may be added slowly as long as it is dissolved. A mixture of 120 grams of salicylate of sodium and 500 grams of saturated solution of chloride of ammonium is then added to the neutral liquid; in a few seconds a voluminous crystallization of salicylate of bismuth is formed, which, after separation from the mother liquor, is washed to remove traces of chloride of ammonium, drained and dried at the ordinary temperature. Thus prepared, the salicylate of bismuth is described as crystallizing in colourless microscopic prisms, resembling in appearance dehydrated sulphate of quinine. It is insoluble in water, cold water having no perceptible effect upon it, whilst boiling water decomposes it, as also does absolute alcohol. From the result of analysis the compound appears to have the composition of a neutral salicylate of bismuth with four molecules of water of crystallization, represented by the formula



The Supposed Hydrates of Alcohol. S. U. Pickering. (*Zeitschr. physikal. Chem.*, vi. 1.) The author has examined by differentiation all the values obtained by other physicists for the densities, without finding any evidence of the existence of these hydrates. He believes that the solid products obtained by Mendeléeff on cooling two solutions of alcohol consist of ice, and not of two definite hydrates.

Purification of Chloroform by Cold. M. Pictet. (*Pharm. Journ.*, 3rd series, xxi. 1069.) The artificial production of cold is being practically applied by the author under a patent, in the purification by congelation of various liquids, and amongst others chloroform. It is stated that when the temperature of the purest brands of commercial chloroform is lowered to -70°C ., partial crystallization takes place. If the crystals be removed and the refrigeration in-

creased, at a temperature below -100° C. the chloroform crystallizes out, and can be removed from a residuary impure fraction. The chloroform so purified is described as being at a temperature of 15° C. a clear liquid of specific gravity 1.51, which can be preserved unaltered for an indefinite time, even in daylight, in white bottles, and without any addition of alcohol. Upon shaking it with concentrated sulphuric acid no coloration of the latter occurs, even after a long time. When shaken with chromic acid mixture no reduction takes place, the mixture remaining yellow.

American Fusel Oil. J. H. Long and C. E. Linebarger. (*Chem. News*, lxi. 185-187.) The author has examined a sample of this oil, and found it to consist chiefly of active and inactive amyl alcohol, with some isobutyl alcohol and isopropyl and ethyl alcohols, and traces of normal propyl and normal butyl alcohols.

Preparation of Urea. J. Volhard. (*Liebig's Annalen*, cclix. 377-380.) As a convenient method for the preparation of moderately large quantities of carbamide, the author recommends the following: A solution of potassium permanganate (63 grams) in water (1 litre) is gradually added to a solution of potassium cyanide (39 grams) and potassium hydrate (10 grams) in water (100 c.c.), the temperature being kept below 17° ; but it is unnecessary to wait until the pink colour has disappeared before continuing the addition of the permanganate. The solution is then placed in cold water for seven to eight hours until it becomes colourless, mixed with a concentrated solution of ammonium sulphate (70 grams), heated to boiling, and filtered; the precipitate is washed with boiling water, the filtrate and washings evaporated to dryness, and the carbamide extracted with 95 per cent. alcohol. The yield is 68 per cent. of the theoretical quantity; but the product still contains a little ammonium chloride and traces of the sulphate, from which it can most easily be freed by treating its aqueous solution with a little precipitated barium carbonate, evaporating to dryness, and then extracting with absolute alcohol.

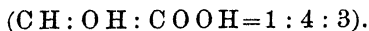
The Constituents of the Artificial Salicylic Acid of Commerce, and their Physiological Action. W. R. Dunstan, O. F. C. Bloch, and M. Charteris. (*Pharm. Journ.*, 3rd series, xxi. 429-437; *Journ. Chem. Soc.*, April, 1891.) The chemical part of this investigation was carried out in the Research Laboratory of the Pharmaceutical Conference by Prof. W. R. Dunstan and Mr. O. F. C. Bloch; while the physiological part of the work was undertaken by Prof. Charteris.

Artificial salicylic acid has been observed to differ in its thera-

peutic action from the pure "natural" acid obtained from the oil of winter-green. Although much work has already been done on the subject with the view of ascertaining the cause of this difference, the exact nature of the impurities contained in the artificial acid of commerce has not been experimentally established. The authors have examined two foreign acids, isolated by Williams in 1878 from commercial salicylic acid, but not then identified. These acids are now shown by their physical and chemical properties, as well as by the analyses of their silver and lead salts, to be orthocresotic or orthohomosalicylic acid [$\text{CH}_3 : \text{OH} : \text{COOH} = 1 : 2 : 3$], and metacresotic or metahomosalicylic acid [$\text{CH}_3 : \text{OH} : \text{COOH} = 1 : 3 : 4$] respectively. The ortho-acid melts at 163° (corr.), the meta-acid at 174.5° (corr.). They have been formed from the corresponding cresols contained in the crude phenol from which the salicylic acid had been prepared.

The melting point of pure salicylic acid has been variously stated, the highest recorded temperature being 159° and the lowest 155° . The authors find that "natural" salicylic acid, after recrystallization from alcohol, melts at 156.75° (corr.), and that if the acid melting at this temperature be converted into the sodium salt, and fractionally precipitated with silver nitrate, the acid recovered from each fraction of silver salt also melts at 156.75° , which may therefore be accepted as the melting point of the pure substance. By very slowly cooling a 1 per cent. solution in hot water, the pure acid may readily be obtained in large, distinct, prismatic crystals, but in presence of about 5 per cent. of one of the cresotic acids, the salicylic acid no longer furnishes large crystals, and the impure acid melts at a lower temperature.

A specimen of the artificial salicylic acid of commerce (m. p. 154.5°) was examined by Williams' method. It was converted into a calcium salt by boiling with water and calcium carbonate, and crystallized many times from water. From the residue of soluble salt from which most of the calcium salicylate had crystallized, there was obtained a small quantity of an acid, which after further purification melted constantly at 151° (corr.). Analysis of the silver and lead salts, as well as its physical and chemical properties, proved it to be paracresotic or parahomosalicylic acid



For the purpose of preparing pure salicylic acid from the impure acid of commerce, the method depending on the different solubilities of the calcium salts was not found satisfactory, being

extremely tedious, owing to the number of recrystallizations that are necessary. A better plan consists in preparing the lead salts by the action of lead carbonate, and crystallizing these from dilute alcohol, lead salicylate being much less soluble than the lead cresotates. By this means 70–80 per cent. of the original acid may be recovered in the form of pure salicylic acid from the first fraction of crystals deposited from the alcoholic solution.

Prof. Charteris undertook to ascertain whether the three cresotic acids described above are poisonous. When administered in alcoholic solution to animals by injection, the ortho-acid was observed to be markedly toxic, the para-acid less so, whilst the meta-acid proved to be innocuous. The ortho- and paracresotic acid were found to cause prostration and paralysis affecting first the hind limbs and gradually extending over the body.

Prof. Charteris recommends the following as additions to the requirements of the British Pharmacopœia :

ACIDUM SALICYLICUM PURIFICATUM.

Characters.—White, separate, large, prismatic crystals, inodorous ; taste at first sweetish, then acid. Soluble in about 500 parts of cold water and 15 of boiling water ; readily soluble in hot chloroform ; soluble in alcohol and ether. Melting point about 157° C. Dose, 10 to 30 grains.

SODII SALICYLAS PURIFICATA.

Obtained by the action of purified salicylic acid on carbonate of sodium.

Characters.—Well defined white odourless crystalline scales, having a sweetish saline taste ; soluble in nine-tenth part of its weight in water, or in 6 parts of rectified spirit. Dose, 10 to 30 grains.

Sodium Paracresotate. H. Helbing. (*Pharmacol. Record*, January, 1891.) The author refers to some recent statements respecting the poisonous characters of paracresotic acid (see preceding abstract), and points out that these are not in accord with the experience of other investigators. He supports his observations by various references to recent scientific literature, and especially quotes the results of Prof. Demme and Dr. C. Henne, who have both investigated the same subject. In the case of rabbits, Prof. Demme gives the lethal dose of sodium paracresotate as 10 grains per kilo., which is stated to be higher than that of sodium salicylate. He has prescribed it with success

as an antipyretic in doses of 15 to 20 grains repeated several times a day without observing toxic effects. The experience of Dr. Henne appears to be similar.

Cresotic and Salicylic Acids. M. Charteris. (*Brit. Med. Journ.*, March 28, 1895.) In consequence of the discussion which followed the reading of his communication to the Pharmaceutical Society on the constituents of the artificial salicylic acid of commerce, the author has carried out some further investigations respecting the physiological action of paracresotic acid.

He reports that an injection of 6 grains of paracresotic acid killed an animal weighing $2\frac{1}{2}$ lbs. in three hours, and that 12 grains killed one weighing $3\frac{1}{2}$ lbs. in the same time; from which result he fixes the lethal dose as about 3 grains per lb. weight of the animal. Orthocresotic acid, in the proportion of 1 grain per lb. weight of the animal, was found sufficient to cause death in twelve to thirty-six hours. A mixture of the acids was still more prompt and pronounced in its action, 5 grains of a mixture containing one part each of ortho- and paracresotic acid to 20 parts of salicylic acid, proving fatal in twelve hours to an animal weighing 2 lbs. The question raised as to the therapeutic value of the sodium salt of paracresotic acid the author declines to discuss, but he considers that his experiments have demonstrated that the removal of ortho- and paracresotic acids from commercial salicylic acid is a *sine quâ non* before the latter can be termed "physiologically pure."

Phenylsalicylic Acid. C. Arbenz. (*Liebig's Annalen*, cclvii. 76-87.) When phenylsalicylic acid, prepared by Graebe's method, is treated with phosphoric chloride (1 mol.) at 100° , it is completely converted into diphenylene ketone oxide (xanthone); concentrated hydriodic or hydrochloric acid at 180° brings about the same change.

Diuretin. M. Marette. (*Journ. de Pharm. et de Chim.*, August 15, 1890, 159.) The author shows that the preparation introduced under this name (*Year-Book of Pharmacy*, 1890, 214) cannot be regarded simply as a double salicylate of theobromine and sodium. Solutions of diuretin are strongly alkaline, and form an abundant precipitate of theobromine as soon as an attempt is made to remove this alkalinity by neutralization with acids. Theobromine is freely soluble without decomposition in solution of caustic soda, forming a compound which Würtz has described as "sodium-theobromine." Diuretin is therefore represented by the author as a mixture of this compound with sodiumsalicylate.

Diuretin. L. Lambert. (*Journ. de Pharm. et de Chim.*, October 15, 1890, 346.) Attention is called by the author to the great instability of this preparation. It is decomposed by all acids, and even mere exposure to the carbonic acid of the atmosphere is sufficient to render it partially insoluble. Taking advantage of the power of carbonic acid to precipitate the theobromine from solutions of diuretin, the author suggests a process based on this reaction for estimating the proportion of alkaloid in this preparation. In his opinion diuretin is not a very suitable form for the administration of theobromine.

Diuretin. Dr. Eckenroth. (*Pharm. Zeit.*, November 12, 1890, 708.) The process for the assay of diuretin suggested by Lambert (preceding abstract) is adversely criticised by the author on the ground that the precipitation of theobromine by carbonic anhydride is incomplete, since some of the alkaloid remains dissolved in the solution of sodium carbonate formed in the process. A preparation containing 49.7 per cent. of theobromine only yielded 41 per cent. by this method. The results obtained with hydrochloric acid are likewise found to be too low.

Assay of Diuretin. G. Vulpius. (*Chem. Centr.*, 1890, ii. 27, 28.) Two grams of diuretin are dissolved in 10 c.c. of water in a porcelain dish, the solution is neutralized with normal hydrochloric acid, and then rendered faintly alkaline with one drop of dilute ammonia. The mixture is allowed to stand for three hours and stirred at frequent intervals, after which the theobromine is transferred to a tared filter, the filtrate being used for washing into the filter any portion of the alkaloid that may have remained in the dish. After removing the last portions of the liquid from the filter as far as possible by gentle suction, the theobromine is washed twice with cold water, each time with 10 c.c., then dried at 100° C, and weighed. The author has found that the weight varies between 0.82 and 0.83 gram in the case of pure diuretin, and that about 0.13 gram remains in the filtrate and washings, thus representing a total proportion of theobromine amounting to 48 per cent. A good preparation ought never to contain less than 46½ per cent. of the alkaloid. The theobromine isolated by this process ought to be readily soluble in sodium hydrate, and should leave no residue upon ignition. When carefully heated, it should first fuse and then sublime.

To determine the salicylic acid, the filtrate, together with the washings, is shaken with 30 c.c. of ether and 2 grams of hydro-

chloric acid, containing 25 per cent. of HCl. The ether is then separated, and allowed to evaporate. The salicylic acid thus left should weigh .77 gram.

In order to prove the absence of caffeine, 1 gram of the suspected diuretin is dissolved in 5 c.c. of water, and the solution neutralized with hydrochloric acid. The precipitate thus formed should be readily soluble in sodium hydrate, and if the mixture be shaken with an equal volume of chloroform, not more than .005 gram of residue ought to remain on evaporation of the latter.

Ferrocyanides of the Alkaloids. H. Beckurts. (*Archiv der Pharm.*, cccxxviii. 347-352. From *Journ. Chem. Soc.*) According as the decomposition of the alkaloid salts by potassium ferrocyanide takes place in neutral or acid aqueous solutions, the resulting alkaloid ferrocyanide is normal or acid. The acid ferrocyanides are prepared by dissolving the alkaloid in concentrated hydrochloric acid, and adding the least possible excess of a concentrated aqueous solution of potassium ferrocyanide; the resulting precipitate is washed and dried. The following acid ferrocyanides were produced. *Atropine* salt, $C_{17}H_{23}NO_3, H_4FeC_6N_6$; amorphous powder, soluble in water and potassium ferrocyanide solution, insoluble in alcohol and ether. *Quinine* salt, $C_{20}H_{24}N_2O_2, H_4FeC_6N_6$; greenish, amorphous powder, soluble in much water and in potassium ferrocyanide solution, insoluble in alcohol, ether, and chloroform. *Quinidine* salt; yellowish-white, crystalline powder, sparingly soluble in water, insoluble in chloroform, alcohol, and ether. *Cinchonine* salt; orange-yellow, crystalline powder, sparingly soluble in water, insoluble in alcohol, ether, and chloroform. *Cinchonidine* salt; reddish yellow, crystalline powder, sparingly soluble in water. *Cocaine* salt ($C_{17}H_{21}NO_4$)₂, $H_4FeC_6N_6$; white, amorphous powder, easily soluble in excess of potassium ferrocyanide solution, sparingly soluble in water, insoluble in alcohol and ether. *Coniine* salt; amorphous, white powder. *Hydrastine* salt; white, amorphous, sparingly soluble powder. *Morphine* salt; white, crystalline powder, easily soluble in water; becomes pale-blue in the air. *Narceine* salt; bluish-white, crystalline powder, somewhat sparingly soluble in water. *Narcotine* salt; bluish-white, crystalline, voluminous powder, easily soluble in water. *Pilocarpine* salt; white crystalline powder, easily soluble in water. *Sparteine* salt; white crystalline powder, easily soluble in water. *Strychnine* salt; white, crystalline powder with a bluish shade, insoluble in cold water and alcohol, decomposed by hot water with separa-

tion of hydrogen ferrocyanide. *Brucine* salt; white, microscopic, prismatic crystals which quickly turn blue in the air; dilute solutions gradually deposit large, white prisms.

The Mydriatic Bases of the Solanaceæ. E. Schmidt and M. Schütte. (*Apoth. Zeit.*, 1890, 511; *Pharm. Journ.*, 3rd series, xxi. 207; *Amer. Journ. Pharm.*, October, 1890.) The object of the authors' investigations was to ascertain the nature of the pre-existing alkaloids in the more important members of this natural order. Young and old belladonna roots (one to two and eight or more years old respectively) were collected at different periods of the year; upon examination they yielded the following average of total alkaloid:

	Per cent.
Young roots collected in spring . . .	0.127
" " " " summer . . .	0.452
" " " " autumn . . .	0.458
Old " " " " spring . . .	0.174
" " " " summer . . .	0.358
" " " " autumn . . .	0.280

The alkaloid from the *young roots* consisted entirely of hyoscyamine, that from the *old roots* chiefly of hyoscyamine with very small quantities of atropine. In the *leaves* of the uncultivated belladonna, collected in spring and autumn, much hyoscyamine with little atropine was found; the ripe *fruit* contained only atropine. The keeping of dried belladonna root does not produce any change of the pre-existing alkaloid, an apparently young root kept for ten years in a store containing only hyoscyamine. The process by which these results were obtained is not published, but it is stated that its reliability was established by adding hyoscyamine and a mixture of hyoscyamine and atropine to powdered glycyrrhiza and isolating the alkaloids; no change of the alkaloids had taken place.

In stramonium seeds much hyoscyamine with small quantities of atropine and hyoscyne was found.

Of *Duboisia* leaves two specimens were examined, one of which contained chiefly hyoscyamine, the other only hyoscyne. In the potato plant, in *Solanum nigrum*, in *Lycium barbarum*, and in *Nicotiana tabacum* traces of mydriatic alkaloids were found which possessed certain resemblances to the belladonna alkaloids; these the authors intend further to investigate.

Belladonna Alkaloids. O. Hesse. (*Pharm. Journ.*, 3rd series, xxi. 662.) The author refers to the question as to whether atro-

pine occurs ready-formed in belladonna, or is a product of alteration in the manufacture. He states that in his experience the herb of cultivated belladonna contains almost exclusively atropine, while it is obtained somewhat less pure from the leaves of the wild plants and in smaller quantity from the roots of both kinds, when freshly collected and operated upon with every precaution to avoid alteration. Referring especially to the statement made by Schmidt and Schütte (see preceding abstract), that in young belladonna roots only hyoscyamine had been found, whilst in older roots, besides much hyoscyamine, there was also a little atropine, the author says that in an old root he found much hyoscyamine, but no atropine. He is of opinion, therefore, that the amount of atropine in belladonna is subject to great variations.

Atropamine. O. Hesse. (*Pharm. Zeit.*, 1890, 471; *Liebig's Annalen*, cclxi. 87-107.) The author has separated a new alkaloid from the roots of *Atropa belladonna*, which he has named *atropamine*. Its composition is represented by the formula $C_{17}H_{21}NO_2$, which agrees with that of pure belladonnine and differs from that of atropine, hyoscyamine, and hyoscyne in containing the elements of one molecule of water less. Unlike belladonnine, it forms beautifully crystalline haloid salts, which property affords a ready means of separating it from all the other belladonna alkaloids. It is liquid at 60° , but solid at ordinary temperatures; it is optically inactive, and does not appear to possess mydriatic properties. Prolonged boiling with alcoholic solution of barium hydrate causes a decomposition with formation of pseudotropine and of several acids. By the action of hydrochloric acid, atropamine is converted into belladonnine, and is then further transformed in the same manner as by heating with alcoholic barium hydrate. When heated with fuming hydrochloric acid at 100° , atropamine yields atropic acid, identical with the compound obtained from atropine under the same conditions. Atropamine may be readily isolated from belladonna root by dissolving the crude mixture of alkaloids in acetic acid, and adding sodium chloride to the solution until a permanent turbidity is produced, when atropamine hydrochloride is deposited in crystals. The free base is obtained in the form of a colourless, semi-solid resin, when the pure hydrochloride is decomposed with ammonia, the base extracted with ether, the ethereal solution washed with ammonia and water consecutively, and then evaporated over sulphuric acid. It is readily soluble in alcohol, ether, chloroform, and benzol, but only sparingly so in light petroleum and water. The hydrochloride, hydrobromide,

platinochloride, and aurochloride are crystallizable salts. The author's experiments tend to show that atropamine stands in the same relationship to hyoscyne that apoatropine does to atropine.

Tropidine. A. Einhorn. (*Ber. der deutsch. chem. Ges.*, xxiii. 2889-2894; *Journ. Chem. Soc.*, 1891, 90.) By the action of aqueous hypochlorous acid on tropidine two compounds are formed, and may be separated by recrystallization from dilute alcohol; the one is deposited in long, lustrous prisms which melt at 138° ; the second is more soluble, separates in white, nodular crystals melting at $108-109^{\circ}$, and has the formula $C_8H_{13}N_2HOCl$.

On heating tropidine with a glacial acetic acid solution of hydrobromic acid in a sealed tube at 100° , the salts of two isomeric hydrobromotropidine hydrobromides are formed, and may be separated by crystallization from alcohol: the more insoluble is termed the α -compound, and the second the β -compound. *α -Hydrobromotropidine hydrobromide*, $C_8H_{14}NBr$, HBr , is obtained as the chief product if the heating is continued for seventy hours; it is very soluble in water, and crystallizes in transparent prisms which melt at $219-220^{\circ}$. The *free base* is liberated by the action of aqueous soda. *β -Hydrobromotropidine hydrobromide*, $C_8H_{14}NBr$, $HBr + H_2O$, is formed if the reaction is allowed to proceed for only twenty-four hours; it crystallizes from alcohol in lustrous prismatic needles melting at $113-114^{\circ}$; on heating to 105° , the anhydrous compound is obtained, which differs, however, from the α -derivative. The *free base* is formed by the action of alkalis; on treating it first with anhydrous sodium acetate and then with aqueous soda, a small quantity of a base is obtained which yields a *platinochloride*, melting at 200° ; tropine platinochloride melts at the same temperature. The author suggests that the compound prepared by Ladenburg, by the action of hydrobromic acid on tropidine at low temperatures, is really identical with β -hydro-bromotropidine.

Tropidine dibromide, $C_8H_{13}NBr_2$, is prepared by treating a glacial acetic acid solution of tripodine with excess of bromine dissolved in the same medium; the oil which separates is washed with sulphurous acid; on the addition of potassium carbonate, the dibromide separates. On adding water to the alcoholic solution, it crystallizes out in small, lustrous plates, which melt at $66-67.5^{\circ}$ with previous softening. On boiling the dibromide with dilute sodium hydrate solution, a penetrating, aromatic odour is produced, which greatly resembles that of dihydrobenzaldehyde.

Conversion of Tropidine into Tropine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xxiii. 1780, 1781, and 2225.) When tro-

pidine is treated with hydrobromic acid, a small quantity of a base is obtained which is not volatile with steam, and may thus be separated from tropidine. After purification, this base proved to be identical with tropine.

Solanidine from Potato Sprouts. A. Jorissen and L. Grosjean. (*Bulletin de l'Acad. Belgique*, 1890 (3), xix. 245.) The young shoots thrown out by potatoes kept in the dark were found by the authors to contain, in addition to solanine and solaneine, a base of the formula $C_{26}H_{41}NO_2$, identical in all respects with solanidine obtained from solanine. The following is said to be a new reaction characteristic of solanidine: a solution of the base in glacial acetic acid is evaporated to dryness on a water bath in a porcelain dish; the residue, treated with concentrated hydrochloric acid and ferric chloride, turns yellow, and heated again until dry, it turns violet.

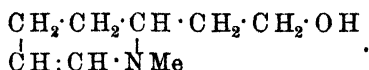
Distribution of Solanine and its Micro-Chemical Reactions. M. E. Wotczal. (*Pharm. Journ.*, 3rd series, xxi. 50.) The author considers that there are only three trustworthy tests for the presence of solanine; viz.: (1) Mandalin's vanadin-sulphuric acid, i.e. 1 part of ammonia-metavanadate in 1,000 parts of trihydrate of sulphuric acid ($H_2SO_4 + 2H_2O$). The test is one of extraordinary delicacy; if the preparation contain solanine, it goes through the following series of colours: yellow, orange-red, purple-red, brown, pure red, violet, blue-green, and then disappearing altogether. (2) Brandt's reaction: 0.3 gram sodium selenate in a mixture of 8 c.c.m. of water, and 6 c.c.m. of pure sulphuric acid. If the preparation containing solanine is first warmed, then, on cooling, it becomes first violet-red, then orange-red and yellow-brown, the colour finally disappearing. (3) Pure sulphuric acid as a micro-chemical reagent; but this test has no advantage over the other two.

Solanine was found in nine species of *Solanum* and three of *Scopolia*. In the tubers it is found chiefly in the neighbourhood of the "eyes." In the vegetative portions it occurs in greatest abundance in the young tissues, and in the mature tissues it is usually entirely wanting, except in the neighbourhood of the buds and of the origin of the roots. In the floral organs the reverse is the case, the quantity of solanine increasing for a time in both calyx and corolla as the flower opens, but ultimately disappearing from these organs, while it continues to increase in the green unripe fruit, diminishing again when the fruit is ripe, and being then localized chiefly in the peripheral layers. The seat of the

solanine is the cell cavity, where it occurs in the form of a soluble salt, and from which also it penetrates the cell wall by diffusion.

The author regards solanine as a product neither of primary synthesis nor of disorganization, nor as a secretion or excretion, nor as a reserve substance, nor as a transporting form like asparagin, but as an intermediate stage in the series of chemical changes which the already forward plastic substances undergo in the living cell. In the flowers and unripe fruits it undoubtedly also serves as a protection against consumption by animals.

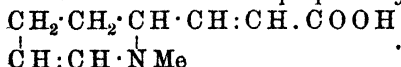
The Relation between Cocaine and Atropine. A. Einhorn. (*Ber. der deutsch. chem. Ges.*, xxiii. 1338-1344; *Journ. Chem. Soc.* 1890, 1010.) It has already been shown by Ladenburg that the tropine obtained from atropine is a 1-methyl- α -hydroxyethyltetrahydropyridine, the position of the double linkage not having been ascertained. Buchka gives, as the most probable formula,



The tropidine obtained from this by elimination of water would then

have the formula $\begin{array}{ccccccc} \text{CH}_2 & \cdot & \text{CH} & \cdot & \text{CH} & \cdot & \text{CH} : \text{CH}_2 \\ | & & & & | & & \\ \text{CH} & : & \text{CH} & \cdot & \text{N} & \text{Me} \end{array}$, which is closely connected

with the formula proposed by the author for anhydroecgonine



By the action of concentrated hydrochloric acid at 280° on anhydroecgonine, the author obtained a mixture of pyridine bases, one of which gave an aurochloride melting at 212°, the base of which appeared to have the formula $\text{C}_7\text{H}_{13}\text{N}$. A micro-crystallographic examination of this salt by Lehmann showed that it contained an impurity. The base was therefore isolated as the *picrate*, which is readily obtained pure by crystallization from water. From this pure compound, the *aurochloride* and *platinochloride* may be obtained in the pure condition. The numbers found on analysis agree with the formula $\text{C}_8\text{H}_{13}\text{N}$, instead of $\text{C}_7\text{H}_{13}\text{N}$, and the crystallographic examination by Arzruni and Lehmann of the three salts, and the corresponding salts of tropidine, has shown their complete identity. The picrate from both sources forms long crystals with a distinct longitudinal cleavage; the aurochloride exists in two enantiotropic modifications, which are converted into one another at a temperature below the boiling point of water. The platinochloride also exists in two modifications,

the one of which is rhombic and the other monoclinic, the former having an orange and the latter a cinnabar-red colour.

These facts show, therefore, the genetic relationships which exist between anhydroecgonine and tropidine, and also support the formula given by Buchka for the latter compound. The only step now wanting for the conversion of cocaine into atropine is the formation of tropine from tropidine by the addition of the elements of water.

Ecgonine. C. Liebermann. (*Ber. der deutsch. chem. Ges.*, xxiii. 2518-2522.) In consequence of an observation by Einhorn that anhydroecgonine when heated with hydrochloric acid yields tropidine, the author has carried out some experiments with the object of ascertaining whether or not ecgonine and tropine would give the same oxidation products under equal conditions.

By oxidation with chromic acid he obtained from 100 grams of ecgonine about 18 grams of tropinic acid, $C_8H_{13}NO_4$, identical in all respects with the compound obtained by Merling in the oxidation of tropine. Along with this he obtained about 14 grams of another acid, the composition of which was found to correspond to the formula $C_7H_{11}NO_3$.

Cocaine Salts. W. Müller. (*Chem. Centr.*, 1890, ii. 818, 819.) Cocaine chromate, $C_{17}H_{21}NO_4 \cdot H_2CrO_4 + H_2O$, is obtained from a concentrated solution of cocaine by precipitation with a 5 per cent. solution of chromic acid in the presence of free hydrochloric acid. By crystallization from hot water it is obtained in orange-coloured needles, which darken on exposure to light. The precipitation of cocaine as chromate from acid solutions is a feature characteristic of this alkaloid, and has been already pointed out as such by K. Mezger (abstract *Year-Book of Pharmacy*, 1890, 98.)

In addition to the foregoing the author describes a double salt of the formula $C_{17}H_{21}NO_4 \cdot HCl \cdot HgCl_2 + 2H_2O$, which is obtained from a solution of cocaine hydrochloride by precipitation with mercuric chloride. It forms slender crystals fusing at $124^\circ C$.

Hygrine. C. Liebermann and O. Kühling. (*Ber. der deutsch. chem. Ges.*, xxiv. 407-415.) It had already been shown by one of the authors that hygrine is a mixture of liquid bases difficult to separate. They have now succeeded in isolating two constituents, and have named them "low-boiling hygrine," $C_8H_{15}NO$, and "high-boiling hygrine," $C_{14}H_{21}N_2O$. Both form crystallizable salts with the halogen acids.

The oxidation of hygrine by means of chromic anhydride and concentrated sulphuric acid yielded an acid of the formula

$C_6H_{11}NO_2$, crystallizing in colourless needles, soluble in water, alcohol, and hot chloroform. The copper salt crystallizes in pale blue needles of the formula $(C_6H_{10}NO_2)_2Cu$. The authors propose to call this product hygric acid.

Caffeine Salts. H. W. Snow. (*Amer. Journ. Pharm.*, June, 1891.) The author's experiments show that in the case of the stronger inorganic acids it is a simple matter to prepare the corresponding salts of caffeine. With the caffeine salts of organic acids it is otherwise. Some of them, namely, the salicylate, benzoate, and oxalate, are prepared with ease, but others are more difficult to prepare. In the case of those with the volatile acids, the combinations are very instable and are very easily decomposed. In regard to the existence of a *normal* citrate, the author is still undecided, but he is inclined to believe that this salt can be prepared by appropriate means. The hydrobromide and hydrochloride crystallize with great ease; the nitrate is somewhat difficult to crystallize, and the sulphate still more so.

The composition of the salts as determined by the author's experiments is as follows:

Hydrochloride, $C_8H_{10}N_4O_2 \cdot HCl \cdot 2H_2O$.

Hydrobromide, $C_8H_{10}N_4O_2 \cdot HBr \cdot 2H_2O$.

Nitrate, $(C_8H_{10}N_4O_2 \cdot HN O_3)_5 \cdot H_2O$.

Sulphate (normal), $(C_8H_{10}N_4O_2)H_2SO_4$.

Oxalate, $(C_8H_{10}N_4O_2)_2 \cdot H_2C_2O_4$.

Salicylate, $C_8H_{10}N_4O_2 \cdot HC_7H_5O_3$.

Caffeidine. E. Schmidt and M. Wernecke. (*Archiv Pharm.*, ccxxviii. 516-543.) Caffeidine sulphate was prepared by boiling caffeine with barium hydrate (Strecker's method) for half an hour only; white, needle-shaped crystals were finally obtained, which are easily soluble in water, much less soluble in alcohol. By treating the sulphate with barium hydrate, a little water, and chloroform, the free base is obtained as a solid, crystalline mass with a neutral reaction; it melts at about 94° . The free base readily decomposes with the formation of ammonia, methylamine, and cholestrophane.

The author also describes the hydriodide, hydrochloride, nitrate, and sulphate of caffeidine, as well as several oxidation and decomposition products of this base.

Cytisine. A. Partheil. (*Ber. der deutsch. chem. Ges.*, xxiii. 3201-3203; *Journ. Chem. Soc.*, February, 1891, 231.) The alkaloid prepared by Husemann and Marmé from the seeds of the

laburnum and other species of *Cytisus*, to which they gave the name of cytisine, may be readily obtained in the following manner: The coarsely powdered seeds are extracted with alcohol containing hydrochloric acid, the alcohol is distilled off, the residue treated with water, and filtered through a wet filter to remove any fatty oil, the filtrate treated with lead acetate, and after separating the precipitated colouring matter, made alkaline with caustic potash, and shaken with amyl alcohol. The latter solution is then extracted with dilute hydrochloric acid, the solution evaporated, the crude cytisine hydrochloride thus obtained treated with dilute alcohol to remove colouring matters, and recrystallized several times from water. The salt then forms well-developed, colourless, transparent prisms. Its *platinochloride* crystallizes in golden-yellow needles, which have the composition $C_{11}H_{14}N_2O, H_2PtCl_6 + 2\frac{1}{2}H_2O$, are tolerably soluble in water, and decompose on heating without melting. The *aurochloride*, $C_{11}H_{14}N_2O, HAuCl_4$, crystallizes in short, reddish-brown, hook-shaped needles, which melt at $212-213^\circ$ (uncorr.) with evolution of gas. From the analyses of these double salts, it follows that cytisine has the composition $C_{11}H_{14}N_2O$, and not $C_{20}H_{27}N_3O$ as given by Husemann and Marmé. The same formula has already been given by Gerrard to ulexine, obtained from the seeds of *Ulex europæus*, which, as Kobert has already suggested on physiological grounds (*Deutsch Med. Wochenschr.*, 1890, 406), may be identical with cytisine. Both compounds are being at present further investigated.

Cytisine. K. Buchka and A. Magalhaes. (*Ber. der deutsch. chem. Ges.*, xxiv. 253-260 and 674-680.) The ground laburnum seeds are extracted with dilute hydrochloric acid, and the solution, after concentration, is made alkaline and extracted with chloroform. On distilling off the latter, cytisine remains as a pale-yellow oil which quickly solidifies to a crystalline mass, and may be obtained almost colourless by repeated crystallization from absolute alcohol. It forms transparent, envelope-shaped crystals, melts at 156° (uncorr.), and may be sublimed; it is very readily soluble in water, alcohol, benzol, and chloroform, but insoluble in carbon bisulphide and light petroleum. Analysis and determination of the molecular weight by Raoult's method have confirmed the formula $C_{11}H_{14}N_2O$, first given by Partheil.

The remainder of this paper deals with two hydrochlorides, the platinochloride, aurochloride, zincochloride, and the following derivatives of cytisine, methylecytisine, acetylcytisine, and nitrocytisine.

Identity of Cytisine and Ulexine. A. Partheil. (*Ber. der deutsch. chem. Ges.*, xxiv. 634-640.) A direct comparison of cytisine with ulexine, prepared by the author from the seeds of *Ulex europæus*, proved that the two compounds are identical. The name "ulexine" should therefore be abandoned in favour of "cytisine."

Strychnine. C. Stoechr. (*Journ. prakt. Chem.* [2], xlii. 399-415.) The author's analyses of strychnine agree with the formula $C_{21}H_{22}N_2O_2$; and those of the ordinary salts of this base confirm the correctness of the generally accepted formulæ of these bodies. The same paper also furnishes an account of trichlorostrychnine and pentachlorostrychnine, and of a re-investigation of the products of the distillation of strychnine with lime.

Strychnine. J. Tafel. (*Ber. der deutsch. chem. Ges.*, xxiii. 2731-2739.) This paper is devoted to the consideration of *methylestrychnine*, *dimethylestrychnine*, *strychnine monohydroxide*, and *strychnine dihydroxide*. For particulars the original paper should be referred to.

Strychnine and Brucine. H. Beckurts. (*Archiv. Pharm.*, ccxxviii. 313-325, and 326-330.) The author's analyses of strychnine agree with the formula $C_{21}H_{22}N_2O_2$. The alkaloid fuses at $265^{\circ}C$.; but if the temperature be raised quickly, the melting point appears to be considerably higher. The pure base employed in these experiments was prepared from commercial nitrate, and obtained in anhydrous, four-sided prisms. The greater part of the author's paper is devoted to the results of a study of the action of bromine on strychnine and brucine, and a full description is given of *monobromostrychnine*, *mononitrobromostrychnine*, *amidobromostrychnine*, *dibromobrucine*, and *dichlorobrucine*.

Laurotetanine. M. Greshoff. (*Pharm. Journ.*, 3rd series, xxi. 662.) A new crystalline alkaloid has been discovered by the author, in several plants belonging to different genera of the Laurineæ. Hitherto only a few alkaloids have been found in plants of this family, and of these only bebeerine can be said to be well known, those occurring in *Daphnidium Cubeba*, *Haasia squarrosa*, *Cryptocarya australis*, and *Daphnandra repandula*, not having come into use. Laurotetanine is a powerful poison, acting like strychnine on the spinal cord and also producing tetanic spasms. It gives with Frohde's reagent a magnificent indigo-blue colour, which, on the addition of water, changes to yellow; with Erdmann's reagent a transitory bright blue colour, becoming brown, and with more nitric acid it gives immediately a

bright red-brown, and with pure nitric acid a dirty brown. It is soluble in excess of alkali. Laurotetanine has been found in *Litsæa chrysocoma*, and *L. javanica*, to the extent of 1 per cent.; in *Tetranthera citrata*, *T. amara*, *T. lurida*, *T. intermedia*, *Notaphabe umbellifera*, *Aperula* sp., *Actinodaphne procera*, and *Illigera pulchra*. In *Haasia firma*, and *H. squarrosa*, an alkaloid was found which seemed to bear a similar relation to laurotetanine that brucine does to strychnine, in that it required to be given in a much larger dose to produce similar results. In the fruits of *Tetranthera citrata* the same percentage of laurotetanine (1 per cent.) was found that Braithwaite obtained of an alkaloid from *Daphnidium Cubeba*, and the author suggests that possibly the fruits referred by Braithwaite to *Daphnidium* were really those of *Tetranthera citrata*, in which case the alkaloid found would be Greshoff's laurotetanine. But the colour reactions obtained by Braithwaite with sulphuric and nitric acids do not appear to correspond with those of laurotetanine. The alkaloid obtained from *Cassytha filiformis* closely resembles laurotetanine, but differs slightly in colour reactions, and further experiments are needed to prove its identity. Alkaloids obtained from *Hernandia ovigera*, *Hernandia sonora*, and *Gyrocarpus asiaticus*, possess apparently paralyzant properties, although presenting some resemblance to laurotetanine in their colour reactions especially those of *Gyrocarpus asiaticus*.

Crystalline Alkaloid of Aconitum Napellus. W. R. Dunstan and W. H. Ince. (*Pharm. Journ.*, 3rd series, xxi. 857.) The authors have investigated the properties of a crystalline alkaloid obtained from the root of *Aconitum Napellus* by extraction with amyl alcohol, as suggested by the late John Williams in 1888. They find the composition of the purified base to correspond to the formula $C_{33}H_{45}NO_{12}$. It crystallizes in tabular prisms belonging to the rhombic system. The crystals are very slightly soluble in water and light petroleum, more soluble in ether and alcohol, most soluble in benzol and chloroform. They melt at 188.5° (corr.). Contrary to the statements of previous observers, who found aconitine to be lævo-rotatory, the authors found an alcoholic solution to be dextro-rotatory $[\alpha]_D + 10.78^{\circ}$; the aqueous solution of the hydrobromide is, however, lævo-rotatory $[\alpha]_D - 30.47^{\circ}$. Two crystalline aurochlorides were obtained, viz. $(C_{33}H_{45}NO_{12}HAuCl_4)$ melting at 135.5° , and $(C_{33}H_{45}NO_{12}AuCl_3)$, melting at 129° .

Aconitine is not appreciably affected by heating at a temperature below its melting point, but at this temperature it is gradually

converted into the uncrystallizable base aconine. Prolonged boiling in aqueous solution induces a similar change, but not to the same extent, unless an alkali is present. Boiling with water acidulated with hydrochloric acid also produces decomposition of the alkaloid.

Apaconitine, which differs from aconitine by the absence of a molecular proportion of water, was obtained by Wright and Luff's process. Its crystals melt at 186.5° , and agree with the formula $C_{33}H_{43}NO_{11}$. In most respects it closely resembles the parent alkaloid. It yielded three aurochlorides.

An *amorphous base* was obtained from aconitine, together with benzoic acid, by prolonged heating with water in a closed tube. It appears to be identical with the *aconine* of Wright and Luff. The same substance was formed together with a resinous substance when aconitine is heated with an alkali. Neither aconine nor its salts could be crystallized. The amorphous base, after purification, and its amorphous aurochloride, afforded analytical data agreeing respectively with the formula $C_{26}H_{41}NO_{11}$, and $C_{26}H_{41}NO_{11} \cdot H Au Cl_4$.

Aconitine. A. Lubbe. (*Chem. Centr.*, 1890, 148, 149; *Journ. Chem. Soc.*, 1891, 91.) From the tubers of the Japanese plant *Kusauzu*, the author has extracted, by means of Duquesnel's method, an alkaloid of the formula $C_{33}H_{44}NO_{12}$, which he considers to be identical with the alkaloid obtained from *Aconitum Napellus*. Wright's formula for aconitine is $C_{33}H_{43}NO_{12}$, whilst that of Jürgens is $C_{33}H_{47}NO_{12}$.

Aconitine forms radially fibrous groups of crystals of the rhombic system. It melts at $183-184^{\circ}$. The taste is not bitter, but prickly and burning. The most delicate reagents for aconitine are hydrogen iodide, and potassium mercury iodide. The hydriodide, even when present in very small quantity (0.02 milligram), appears crystalline under the microscope. Pseudoaconitine could not be detected. The author finds that aconitine has the same physiological properties as are ascribed to it by Lewins, acting on the extremities of certain nerves. It does not appear itself to undergo any change, nor does it in any way decompose the blood corpuscles.

From the tubers of Langaard's variety, "*Shirakawauzuware*," of "*Aconitum sinense*," the author obtained 0.02 per cent. of a crystalline alkaloid and two amorphous bases. He considers the alkaloid to be identical with aconitine from *Aconitum Napellus*; it melts at 180.9° . Pseudoaconitine could not be detected.

The Aconites and Aconitines. E. Richards, and F. A. Rogers. (*Chemist and Druggist*, February 7, 1891, 205, and February 15, 1891, 242, 243.) The authors arrive at the following conclusions :—

The best material for the preparation of aconitine is the fresh root of *Aconitum Napellus*.

The alkaloid resides chiefly in the cambium layer, the fibro-vascular bundles, and the sieve ducts.

Pure aconitine crystallizes in thin, flat, hexagonal prisms with acute ends.

It is probable that two isomeric forms of aconitine exist ; for these the terms α -aconitine and β -aconitine are suggested.

The composition of aconitine corresponds to the formula $C_{33}H_{43}N_2O_{12}$, which contains twice as much nitrogen as the formula hitherto accepted.

The proportion of alkaloid in the root is as follows :—

	Per cent.
Aconitum Napellus, fresh . . .	·71
" " dried . . .	·14
Japanese aconite, dried . . .	·57

The method for the preparation of aconitine, recommended by the authors, is as follows : The powdered tuber is macerated from three to four days, with washed fusel oil, then percolated and the alkaloid extracted from the percolate with small quantities of dilute sulphuric acid. The fusel oil is removed from this solution by treatment with ether, and the dissolved ether driven off by heat. The alkaloid is precipitated from the acid solution by solution of sodium carbonate, collected on a strainer, pressed between limestones, and then spread on bibulous paper and allowed to dry at ordinary temperature. The dried alkaloid is then boiled with pure dry ether and the filtrate set aside to crystallize ; the crystals are redissolved in a small quantity of ether to remove a gum-like body.

The toxicity of α -aconitine is stated to be only one-sixth of that of β -aconitine.

Tritopine, a new Opium Base. M. Kander. (*Pharm. Journ.*, 3rd series, xxi. 247.) The author reports the isolation of a new opium alkaloid, *tritopine*, which occurs in smaller quantity than even protopine, and to which he assigns the formula $C_{42}H_{54}N_2O_7$ (*Archiv*, ccxxviii., p. 419). Like morphine and laudanine it is soluble in soda solution, but it is reprecipitated in an oily condition by excess of the reagent. Its melting point, $182^\circ C.$, is, however,

160° higher than that of laudanine, although the resemblance is again apparent in its behaviour towards sulphuric acid. Tritopine crystallizes without water of crystallization in characteristic transparent needle-like plates, and appears to be a di-acid base.

Derivatives of Morphine. W. Danckwortt. (*Archiv Pharm.*, ccxxviii. 572-595; *Journ. Chem. Soc.*, 1891, 332.) Morphine, when heated with excess of acetyl chloride, yields diacetylmorphine (the tetracetylmorphine of Wright). This compound, when boiled with water, loses only one acetyl group, and α -monoacetylmorphine is formed; by the addition of hydrochloric acid this can easily be obtained as the sparingly soluble hydrochloride. The β -monoacetyl (β -diacetyl of Wright) compound was prepared by Becket and Wright's method, but their γ -compound was not obtained. The stability of morphine was not found to be increased by the entrance of the acetyl group, as shown by the reaction of diacetylmorphine with dilute nitric acid and with bromine, although this is known to be the case with codeine and the methyl group. Anhydrous morphine, when heated at 100-110° with twice the amount of benzoic chloride, yielded dibenzoylmorphine, which supports the view that the morphine molecule contains only two hydroxyl groups. Polstorff's tribenzoylmorphine could not be detected. By heating oxydimorphine with acetic chloride, tetracetyloxydimorphine is obtained, which doubtless is identical with Hesse's diacetylpsedomorphine, obtained by the action of acetic anhydride on pseudomorphine. The entrance of the four acetyl groups indicates that four hydroxyl groups exist intact in the oxydimorphine, and that the hydrogen atoms replaced must have been united with carbon. Apomorphine, when treated with excess of acetic chloride, yields monoacetylapomorphine; hence only one hydroxyl group is present in apomorphine, the second hydroxyl group of morphine during its conversion into apomorphine going to form a molecule of water. Probably the alcoholic hydroxyl of morphine is the one expelled, the phenyl hydroxyl having greater stability. This, to some extent, will account for the chemical and physiological difference between morphine and apomorphine.

A New Alkaloid from Conium Maculatum. E. Merck and A. Ladenburg. (*Chem. Centr.*, 91, I, 414; *Ber. der deutsch. chem. Ges.*, xxiv. 1671.) E. Merck has obtained a small quantity of a new alkaloid by fractional distillation in vacuo from the high boiling portions of crude coniine. It crystallizes in needles which are easily soluble in alcohol, ether and chloroform.

A. Ladenburg assigns to this base the formula $C_8H_{17}NO$ and considers it an isomer of conhydrine, for which reason he proposes for it the name *pseudoconhydrine*. It fuses at $100-102^\circ C.$, and boils at $229-231^\circ C.$ It sublimes below the melting point. The alkaloid is optically active, and, like conhydrine, must be a secondary base, since it yields a nitrosamine upon warming its hydrochloride with sodium nitrite. The formation of an iodine derivative by treatment with hydriodic acid, in which an iodine atom replaces a hydroxyl group, also indicates that, like conhydrine, this body belongs to the class of bodies termed alkins.

Nicotine. A. Pinner and R. Wolffenstein. (*Ber. der deutsch. chem. Ges.*, xxiv. 61-67). When nicotine is mixed with platinum sponge and such a quantity of hydrogen peroxid that 3 atoms of active oxygen are present for each molecule of the base, and the whole allowed to remain for several weeks, the nicotine odour completely disappears. After this time the mixture is found to contain a new base, answering to the formula $C_{10}H_{12}N_2O$, which is formed from nicotine by the substitution of one atom of oxygen for two atoms of hydrogen, and may be termed for the present *oxynicotine*. It is not volatile in a current of steam, is scarcely acted on by aqueous potash, and has physiological properties resembling, but much feebler than, those of nicotine. On oxidation with potassium permanganate, it is converted into nicotinic acid.

Constitution of Nicotine. F. Blau. (*Ber. der deutsch. chem. Ges.*, xxiv. 326-329.) The author has prepared α - β -dipiperidyl and compared it with hexahydronicotine obtained from nicotine by Liebrecht; he finds that these two compounds are not identical.

From a consideration of the boiling points of the dipiperidyls at present known, the author is inclined to think Liebrecht's hexahydronicotine does not belong to the dipiperidyl series. He is at present engaged in the preparation of $\beta\beta$ -dipiperidyl, and the examination of the behaviour of hexahydronicotine on further reduction.

Observations on Quinine, Cinchonidine and their Isomers. O. Hesse. (*Pharm. Journ.*, 3rd series, xxi. 21.) The author has carefully re-determined the melting points of anhydrous quinine prepared in different ways. As a mean of several determinations he finds the melting point of the anhydrous base obtained by direct crystallization to be $174.7^\circ C.$, and that of the base obtained by heating the trihydrate or the benzene compound about $171.8^\circ C.$

The anhydride is formed when solutions of quinine in certain

indifferent solvents, such as dilute alcohol, are exposed for a long time to a temperature of $30^{\circ}\text{C}.$; and it is again converted into ordinary quinine when subjected to the continued action of dilute sulphuric acid. When the anhydride is dissolved with moderately warm dilute sulphuric acid in the corresponding molecular proportions, only ordinary quinine sulphate crystallizes on concentrating the solution, so that there is in that case a rapid conversion of the one form of base into the other.

In addition to his former statement of the differences between ordinary quinine and the crystalline anhydride the author again suggests that they should be regarded as isomeric forms of this base, and in order to distinguish them he proposes to call the higher melting base homoquinine. Although this name has already been applied by Howard and Hodgkin to a substance that afterwards proved to be a compound of quinine with another base, its appropriation in that sense has now been done away with.

The relations between cinchonidine and homocinchonidine are similar to those obtaining between quinine and homoquinine. In order to clear up the confusion met with in chemical literature respecting these two bases, the author gives a brief sketch of their history. In 1877 he showed the difference between these bases by the behaviour of their neutral sulphates, but assigned to homocinchonidine the formula $\text{C}_{19}\text{H}_{22}\text{N}_2\text{O}$, that is now adopted, and to cinchonidine the old formula $\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}$, expecting that his further investigations would clear up this point.

Anticipating that result, however, Skraup and Vortmann published a paper on "cinchonidine," in which, contrary to their intention, they dealt with homocinchonidine instead of cinchonidine, and it was not until a later period that Skraup recognised the identity of homocinchonidine with the base to which the author had given that name. The fact that Skraup and Vortmann were working with homocinchonidine, and not as they thought with cinchonidine, is shown by their misinterpretation of a statement as to the solubility of homocinchonidine in ether attributed to Koch by Skraup, but which was never made by Koch. In consequence of this misunderstanding, Skraup and Vortmann got rid of the cinchonidine and retained the homocinchonidine, which they examined and described as being cinchonidine. The existence of homocinchonidine, therefore, was not placed in doubt, as de Vrij has supposed, by the paper of Skraup and Vortmann, but it was the existence of the base to which the author gave the name of cinchonidine that was disputed. Skraup subsequently

endeavoured to prove the non-existence of this latter base by means of preparations obtained from the author. More recently de Vrij made known a simple method of preparing the very base which the author had named cinchonidine. In reference to this communication of de Vrij's, the author mentions that he had from time to time prepared the tetrasulphate originally described by him, recrystallizing it from dilute sulphuric acid or from alcohol, then neutralizing the water solution, and separating from the sulphate deposited the still adhering homocinchonidine by means of recrystallization from water in the manner that has been described. A pure cinchonidine salt may be obtained even by repeated recrystallization of the tetrasulphate from dilute sulphuric acid or alcohol, as shown by the author more than ten years ago. The uncorrected melting point of cinchonidine was found by the author to be from 199.7° to 200.5° C. (mean about 200.1° C.), when determined by the method then in use (Clauss gives 201° C., Schäfer 199°), and that of homocinchonidine was found to be from 205° to 206° C., or nearly six degrees higher than the melting point of cinchonidine. By the use of Roth's apparatus the melting point of cinchonidine was found to be from 202° to 202.8° C., mean 202.4° C., and that of homocinchonidine from 207° to 208.2° C., mean 207.6° C. By the same means, Lenz, without attempting a separation of homocinchonidine from cinchonidine found the melting point of the base obtained from once recrystallized tetrasulphate to be from 207° to 207.5° C., and that of twice recrystallized salt 204.5° to 205° C., and that of the base crystallized from ether 205° to 206° C., while that of a sample of cinchonidine obtained from the author was found to be 204.5° to 205.2° C., or in all instances higher than that of cinchonidine. Whether these differences were due to the presence of some homocinchonidine or to other circumstances remains undecided, but in any case the mean values of 205.1° and 207.2° C. (corrected) adopted by Lenz for cinchonidine and quoted in Beilstein's "Handbook," are to be rejected as inappropriate.

When pure cinchonidine is dissolved in moderately warm sulphuric acid containing 25 per cent. H_2SO_4 , in the proportions of 1 gram to 8 c.c., the greater part crystallizes on cooling the solution in the form of tetrasulphate, and on examination of the base obtained from that salt as well as from the mother liquor both will be found to have the same melting point as the original base; under those conditions there is no alteration of the base. When

homocinchonidine is treated in the same manner there is a similar though not quite so large a crystallization, but in this case the base separated from the mother liquor has a melting point of about 206°C . and that obtained from the crystals melts at 203° to 204°C . By further recrystallization of the salt from dilute sulphuric acid pure cinchonidine tetrasulphate may easily be obtained. When the same treatment is applied to the base obtained from the mother liquor a further quantity of cinchonidine tetrasulphate is obtained. By this means it is not difficult to convert almost entirely into cinchonidine the homocinchonidine remaining in the last mother liquor together with some cinchonidine.

On the other hand, cinchonidine may be easily converted into homocinchonidine. When the above mentioned solution is heated in a close tube to 140°C . for six or eight hours no crystallization takes place on cooling, and it is easy to ascertain from the melting point of the base in that case and from the behaviour of the neutral sulphate, that homocinchonidine is present. The acid solution will often remain for several days in this condition; after a time crystallization commences and proceeds more or less rapidly, indicating the reconversion of homocinchonidine into cinchonidine. The change may be accelerated by dropping a crystal of cinchonidine tetrasulphate into the solution, and thus it is perfectly easy to prepare homocinchonidine from cinchonidine or the reverse.

The two bases are distinguishable, apart from other differences, by their melting points being nearly six degrees different; but the statements published as to this particular might still more differ from each other if the melting points are not determined in the same manner. The author's former data of $199^{\circ}\cdot 7$ to $200^{\circ}\cdot 5\text{C}$. apply to the uncorrected melting point of cinchonidine determined according to the method then adopted, while Skraup and Vortmann give $210^{\circ}\cdot 5\text{C}$. as the corrected melting point of their cinchonidine that was in fact homocinchonidine. In several handbooks both substances have, in consequence of the statements of Skraup, de Vrij and others, been confused together under the name of cinchonidine, and thus there have naturally been great differences between the statements as to melting point. The author, however, disclaims responsibility for these discrepancies, since he has repeatedly insisted upon the difference between the two bases and their melting points.

The author has satisfied himself that the β -cinchonidine which at one time he obtained from cinchonidine by means of hydrochloric acid is chiefly homocinchonidine. It is therefore inferred

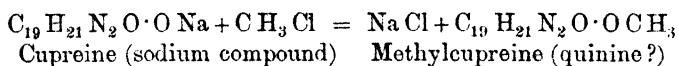
that by heating cinchonidine with hydrochloric acid of 1.125 sp. gr. to 140°C . the base is at first converted into homocinchonidine, which is then further changed into apocinchonidine. When sulphuric acid of the suitable strength is used this alteration does not proceed beyond the first stage.

In conclusion, the author points out that the occurrence of hydroquinine and hydrocinchonidine indicates the presence of at least one double carbon bond in quinine as well as in cinchonidine, but that it remains to be determined whether the above mentioned relations between quinine and homoquinine, as well as cinchonidine and homocinchonidine, would be satisfactorily accounted for by the assumption of a change in the situation of that bond.

Albuminate of Quinine. M. Tarozyi. (*Union Pharm.*, May, 1896; *Pharm. Journ.*, 3rd series, xxi. 1069.) The author calls attention to a compound of egg albumen and quinine possessing the property of not being decomposed by the strongest alkalies. It is claimed that the preparation is easily absorbable by the mucous membrane of the stomach and passes into the circulation, where it exercises its therapeutic properties without undergoing decomposition, under conditions in which the ordinary salts of quinine are broken up by the alkaline liquids of the system. This "albuminate of quinine," is stated to be prepared by double decomposition between sulphate of quinine and albuminate of soda, but the manner of operating is not indicated. The product is a white, amorphous, bitter substance, said to contain 56 per cent. of quinine; it is alkaline in reaction, dissolves more readily in hot water or alcohol than in cold, and more freely still in water acidulated with lactic or hydrochloric acid. It may be distinguished from other salts of quinine by treating it with water acidulated with sulphuric acid, which forms with the quinine soluble acid sulphate, the albumen being precipitated after standing.

Transformation of Cupreine into Quinine. E. Grimaux and A. Arnaud. (*Comptes rendus*, April 13, 1891; *Pharm. Journ.*, 3rd series, xxi. 978.) The comparison of the formulæ of quinine and cupreine had already led O. Hesse to infer that the former may be a methyl ether of the latter, the two bodies standing in the same relation to each other as anisol, $\text{C}_6\text{H}_5\cdot\text{O}\cdot\text{CH}_3$, to phenol, $\text{C}_6\text{H}_5\cdot\text{OH}$. This supposition has now been completely verified by the authors. Upon boiling for several hours under an upright condenser a solution of cupreine in methyl alcohol, to which the

theoretical quantity of sodium and excess of methyl iodide had been added, a mixture of two iodomethylates was obtained, possessing all the physical characters of the compounds resulting from similar treatment of quinine. Further, by the substitution of methylchloride for the iodide and conducting the operation in a sealed tube at 100° C., a base was obtained, which, isolated as sulphate, conformed to all the physical and chemical characteristics of quinine, so that a reaction of the following nature may obtain :



The authors comment upon the frequency with which the methyl group occurs in chemical products of the vegetable kingdom, to the almost entire exclusion of the ethyl group, and consider that the assumed reduction of the absorbed carbonic acid gas to formic aldehyde and subsequently to methyl alcohol in the economy of the plant would furnish sufficient explanation of the fact. It is also proposed by these chemists to prepare the homologous ethers of cupreine and compare their physiological action with that of quinine.

Metallic Derivatives of Cupreine. A. C. Oudemans. (*Rec. Trav. Chim.*, ix. 171-183. From *Journ. Chem. Soc.*) The sodium and potassium compounds of cupreine separate as crystalline scales when a solution of the alkaloid in slight excess of the corresponding hydrate is subjected to cold. The separated scales are dried by a filter pump, washed rapidly with strong alcohol, and placed in a desiccator over potassium hydrate for some time. *Potassium cupreine*, $\text{C}_{19}\text{H}_{21}\text{K N}_2\text{O}_2 + 8\text{H}_2\text{O}$, forms acicular crystals or hexagonal scales. *Sodium cupreine*, $\text{C}_{19}\text{H}_{21}\text{Na N}_2\text{O} + 5\text{H}_2\text{O}$ and $+8\text{H}_2\text{O}$, forms large scales which are greasy to the touch. The potassium compound appears to be more soluble in mixtures of aqueous and alcoholic alkalies than the sodium derivative.

In contradistinction to Hesse, who denied the existence of an ammonium derivative of cupreine, the author states that the alkaloid dissolves easily in concentrated ammonia solution, to a smaller extent in weaker solutions, and inasmuch as the specific rotatory power of such solutions is similar to that of like solutions of the sodium derivative, he concludes that an ammonium compound does exist. Solutions of lithium hydrate and of barium hydrates also dissolve cupreine. All the metallic derivatives of

cupreine assume an orange or brick-red colour after prolonged drying or on heating above 120° .

Hesse having proved that cupreine behaved as a phenol in which hydrogen may be displaced by a metal, the author has investigated the influence such replacement has on the specific rotatory power of the alkaloid, in order to determine if the alkaloid and the base combined molecule for molecule, in which case an excess of base ought not to affect the specific rotatory power to any great extent, and he publishes very complete tables of the specific rotatory power of the alkaloid in both aqueous and alcoholic solutions of potassium and sodium hydrates, in aqueous solutions of lithium and barium hydrates, and in ammonia solution.

The results of the observations are as follows: 1. Approximately the same values obtain for the specific rotatory power of cupreine for similar concentrations of alkaloid and either potassium, sodium, lithium, and barium hydrates in aqueous solution, but in the case of the ammoniacal solution the rotatory power has a higher value, and differs in the values obtained from its solution in fixed alkalies in the fact that an increased strength of ammonia solution augments the specific rotatory power. 2. The specific rotatory power of the alkaloid diminishes inversely with the amount present in the alkaline solution, and also with the amount of alkaline hydrate present. 3. The highest values for the specific rotatory power are obtained when the amounts of alkaloid and of hydrate associated are approximately those represented by their molecular weights; in this respect cupreine is analogous to quinamine and conquinamine in acid solution. It is to be noted that the values obtained in alkaline alcoholic solution are much higher than those in aqueous solution, and that in this case additional alkali increases the rotatory values.

The mean rotatory power for 1 mol. (in milligrams) of cupreine in 20 c.c. of water with 1-2 mols. (in milligrams) of alkaline hydrate is about -205° .

Isocinchonine. O. Hesse. (*Liebig's Annalen*, cclx. 213-226. From *Journ. Chem. Soc.*) Isocinchonine, $C_{19}H_{22}N_2O$, is formed when commercial cinchonine sulphate (30 grams) or the free base is dissolved in concentrated sulphuric acid (150 grams), the solution heated at $60-80^{\circ}$ for six hours, and then kept for twenty-four hours at the ordinary temperature; the solution is diluted, gradually mixed with excess of soda, and extracted with ether; on concentrating the ethereal extract, small quantities of hydrocinchonine

and apocinchonine are deposited in crystals, and on further evaporation, there remains an oily residue which gradually solidifies, and from which pure isocinchonine can be obtained by repeated recrystallization from ether, or by converting the base into the hydrochloride. Isocinchonine crystallizes from ether in compact, colourless, anhydrous prisms, melts at 125° , volatilizes at a high temperature, and is moderately easily volatile with steam; it is readily soluble in alcohol, ether, acetone, chloroform, and light petroleum, but insoluble in water and alkalies. Its alcoholic solution turns red litmus blue, but has no action on phenolphthalein paper; an absolute alcoholic solution of the base is laevorotatory, and at 15° $[\alpha]_D = -53.7^{\circ}$ when $p=1$, and $[\alpha]_D = -55.6^{\circ}$ when $p=3$. The hydrochloride, $C_{19}H_{22}N_2O, HCl + H_2O$, prepared by neutralizing the base with dilute hydrochloric acid, crystallizes in hexagonal prisms, and loses its water at $140-150^{\circ}$, the anhydrous salt melting at 201° ; it is readily soluble in hot water, and moderately easily in alcohol and chloroform, but only sparingly in cold water, and insoluble in ether; its rotatory power at 15° in aqueous solution is $[\alpha]_D = -68.6$ when $p=1$, and $[\alpha]_D = -71.2^{\circ}$ when $p=2$, but the addition of hydrochloric acid to the solution diminishes the rotatory power. The platinochloride $(C_{19}H_{22}N_2O)_2, H_2PtCl_6 + 3H_2O$, prepared by adding sodium platinochloride to an aqueous solution of the hydrochloride, is a pale yellow, sparingly soluble compound. The acid platinochloride, $C_{19}H_{22}N_2O, H_2PtCl_6 + 2H_2O$, is precipitated on adding platinic chloride to an aqueous solution of the hydrochloride, but the yellow, amorphous compound thus produced readily loses 1 m.l. H_2O , changing into a crystalline salt; the latter forms orange needles, and is rather sparingly soluble in hydrochloric acid, and almost insoluble in cold water. The aurochloride, $C_{19}H_{22}N_2O, 2HAuCl_4$, is obtained as a yellow, amorphous precipitate on adding auric chloride to an aqueous solution of the hydrochloride; it is sparingly soluble in cold water. The mercuriochloride, $C_{19}H_{22}N_2O, Hg_2Cl_2$, crystallizes in small, concentrically grouped needles. The normal sulphate $(C_{19}H_{22}N_2O)_2, H_2SO_4 + 6H_2O$, crystallizes in prisms, and is readily soluble in alcohol and water; the acid sulphate, $C_{19}H_{22}N_2O, H_2SO_4 + 4H_2O$, crystallizes in needles, and is readily soluble in hot, but only moderately easily in cold, water. The oxalate $(C_{19}H_{22}N_2O)_2, H_2C_2O_4$, thiocyanate, hydriodide (with 1 mol. H_2O), and the zinc double salt, $C_{19}H_{22}N_2O, 2HCl, ZnCl_2$, crystallize in needles.

When "pure" commercial cinchonine acid sulphate is boiled

with dilute sulphuric acid as described by Jungfleisch and Léger, small quantities of apocinchonine and cinchonigine are formed, but cinchonibine and the two hydroxy-bases described by Jungfleisch and Léger are not produced; cinchonifine and cinchoniline are probably identical with hydrocinchonine and apocinchonine respectively, and cinchonigine is identical with isocinchonine.

When cinchonine sulphate is treated with sulphuric acid and oxalic acid at 125–130°, as described by Caventon and Girard, it yields hydrocinchonine, isocinchonine, and a base which is probably identical with that formed by heating cinchonine oxalate with sulphuric acid; it would seem, therefore, that in this reaction some of the cinchonine is converted into cinchonine.

Isoquinoline. A. Edinger and E. Bossung. (*Journ. prakt. Chem.* [2], xliii. 190–200.) In this paper a description is given of dibromide and hydrobromide of isoquinoline, as well as of bromo-, nitrobromo-, and amidobromo- derivatives of this base. For particulars reference should be made to the original.

Bromo-Derivatives of Quinoline. A. Claus and A. Welter. (*Journ. prakt. Chem.* [2], xlii. 233–247.) The authors report upon dibromo-, tribromo-, and tetrabromo-quinoline, giving a full description of each. For particulars, the original should be consulted.

Hydrocotoïn, a Constituent of Coto-Bark. G. Ciamician and P. Silber. (*Ber. der deutsch. chem. Ges.*, xxiv. 299–301.) The authors' determinations of the molecular weight of this body agree well with the formula $C_{15}H_{14}O_4$. A repetition of Zeisel's experiments show that it contains two methoxy-groups, $C_{12}H_8O_2(O Me)_2$. By heating hydrocotoïn with methyl iodide and a methyl alcohol solution of potash at 100° C. colourless needle-shaped crystals of methylhydrocotoïn, $C_{13}H_7O(O Me)_3$, are obtained. Heating with alcoholic potash in sealed tubes splits up hydrocotoïn into benzoic acid and a phenol-like substance.

Hydrastine. M. Heim. (*Ber. der deutsch. chem. Ges.*, xxiii. 2469.) The compound (m.p. 166–169°) obtained by Freund and Rosenberg from methylhydrastine methiodide by the action of alkalis, is found to have the formula $C_{20}H_{22}O_9$, not $C_{20}H_{20}O_8$ as previously stated by them. F. Schmidt prepared, by the same method, a compound of the formula $C_{20}H_{18}O_7$; the difference may possibly be caused by the manner of drying, the one being done at ordinary temperatures, the other at 100°.

Hydrastine. M. Freund and M. Heim. (*Ber. der deutsch. chem. Ges.*, xxiii. 2897–2910.) On boiling an alcoholic solution of hydrastine methiodide with concentrated aqueous ammonia, a

compound is obtained crystallizing from alcohol in white, strongly refractive, rhombic plates, which melt at 180°C , are almost insoluble in water, and dissolve sparingly in ether, carbon bisulphide, or benzol. This substance, for which the name *methylhydrastamide* is proposed, is a powerful base, answering to the formula $\text{C}_{22}\text{H}_{20}\text{N}_2\text{O}_6$, and possessing the power of decomposing ammonium salts. It may also be obtained by the action of ammonia on methylhydrastine. *Methylhydrastamide*, $\text{C}_{22}\text{H}_{24}\text{N}_2\text{O}_5$, is prepared by the action of dilute acids, or of concentrated potassium hydrate solution, on the amide, and crystallizes from alcohol in slender, light yellow needles which melt at 192° , and are insoluble in water.

Various compounds and derivatives of these two preparations are also described by the authors.

Berberine. R. Gaze. (*Chem. Centr.*, 1890, 590-591.) Pure berberine is prepared by the author in the following way: 50 grams of berberine sulphate are treated with 1000 grams of water and 500 grams of acetone, in the presence of sodium hydrate. The acetone-berberine, $\text{C}_{20}\text{H}_{17}\text{NO}_4$, $\text{C}_8\text{H}_8\text{O}$, is then decomposed by heating with chloroform for twelve hours. Berberine thus obtained contains six molecules of water. Pure berberine salts may be prepared from acetoneberberine by heating it with the acid until completely dissolved. The author describes some of these salts, as well as salts and derivatives of *hydroberberine*, $\text{C}_{20}\text{H}_{21}\text{NO}_4$, the base which was first prepared by Hlasiwicz and Gilm by the action of sulphuric acid, glacial acetic acid, and water on berberine sulphate. For particulars, reference should be made to the original paper.

The Volatile Alkaloid of Ipecacuanha. E. M. Arndt. (*Apoth. Zeit.*, 1890, 780.) A further study of this alkaloid has established its identity with choline. The author again calls attention to the fact that the presence of this alkaloid is likely to cause errors in the estimation of emetine in ipecacuanha. It is known that in preparations of the root containing acids more alkaloid is found than in preparations in which no acid was used; this is explained by the emetine being present in the ipecacuanha in a soluble form, while the choline is present in insoluble form, but easily rendered soluble by use of acids.

Veratrine. F. B. Ahrens. (*Ber. der deutsch. chem. Ges.*, xxiii. 2700-2707.) The author shows that veratrine forms a *mercurochloride*, $\text{C}_{32}\text{H}_{49}\text{NO}_9$, H_2Cl_2 , and a *picrate*, $\text{C}_{32}\text{H}_{49}\text{NO}_9$, $\text{C}_6\text{H}_3\text{N}_3\text{O}_7$, both of which, like the aurochloride, are crystalline. With bromine it forms a *tetrabromide*, $\text{C}_{32}\text{H}_{49}\text{NO}_9\text{Br}_4$. The

author confirms Bossetti's observation that upon treatment with alcoholic baryta solution, veratrine yields angelic acid and cevidine, $C_{27}H_{45}NO_9$. He also confirms the statement by Wright and Luff, that the action of alcoholic potash on veratrine results in the formation of tiglic acid and cevine, $C_{27}H_{43}NO_8$, but finds that in this reaction angelic acid is first formed, and is subsequently converted into tiglic acid. When boiled with strong hydrochloric acid, veratrine yields tiglic acid, $C_5H_8O_2$, and a crystalline ruby red body, which is probably the hydrochloride of a new base. When oxidised with potassium permanganate, veratrine yields acetic and oxalic acids, while the oxidation with chromic acid gives rise to the formation of acetaldehyde and carbonic acid.

Veratrine. S. Stransky. (*Monatshefte*, xi. 482-485.) On distillation with alcoholic potash, commercial veratrine gave rise to the two bases cevidine and veratroine; angelic and veratric acids were simultaneously formed. When distilled with aqueous potash, the yellow, resinous mixture of bases furnished methylamine, and a yellow oil having an odour resembling that of the homologues of pyridine.

The Alkaloids of the Rhizome of Veratrum Album. C. Pehkschen. (*Pharm. Zeitschr. für Russland*, xxix. 399; *Journ. Chem. Soc.*, January, 1891.) The rhizome of the wild plant gives 0.57 to 0.66 per cent of mixed alkaloids, whilst the cultivated rhizome yields only 0.29 per cent. The powdered root is macerated with alcohol during six days at the ordinary temperature, and this treatment repeated a second and third time, the last time with the addition of acetic acid. The first alcoholic extract is faintly acid from the presence of jervic acid. The alcoholic solutions are united, and the major portion of the alcohol is removed by distillation under reduced pressure; on the addition of 3 to 4 vols. of boiling water, resinous substances are precipitated, which are removed by filtration. The remaining resinous and colouring matters are removed by agitation with ether. Sufficient sodium bicarbonate is then added to produce alkaline reaction, then ether, and subsequently chloroform. When the ether and chloroform solutions are evaporated, the mixed alkaloids are left, and these on being treated with absolute ether, give veratroïdine and a minute amount of jervine in solution, whilst the insoluble portion contains jervine and a third alkaloid, pseudojervine. *Veratroïdine*, $C_{32}H_{53}NO_9$, melts at about 149° , and chars at about 172° . It is optically inactive. At 22.5° one part dissolves in 13 parts of benzol, 5.9 of chloroform, and 9.09 of absolute ether. It dissolves in alcohol in almost all pro-

portions. Veratroidine yields amorphous salts with hydrochloric, hydrobromic, sulphuric, nitric, oxalic, and acetic acids. Most of the general reagents for alkaloids give with this base more or less of a precipitate, according to the state of concentration. A hydrochloric solution of 1:5000 gives a faint turbidity with mercury potassium iodide, and a solution of 1:3500 a turbidity with phosphomolybdic acid. With concentrated sulphuric acid, veratroidine gives a yellow liquid which passes through orange-red to cherry-red, with a green fluorescence, whilst concentrated nitric acid produces a transient rose-colour which soon passes to citron-yellow. Moderately diluted hydrochloric acid gives a beautiful rose coloration; this serves to distinguish veratroidine from veratrine. Veratroidine, when heated at 120° with ethyl iodide in a sealed tube for 40 hours, yields the compound $C_{32}H_{53}NO_9$, 2 Et I. *Pseudojervine*, $C_{29}H_{49}NO_{12}$, forms large, rhombic crystals. The root does not contain more than 0.006 per cent. The alkaloid begins to turn yellow at 215°, and melts at 259° with blackening. It is optically inactive. At 25°, 1 part of this base dissolves in 10.876 parts of light petroleum, in 372 parts of benzene, 1021 parts of absolute ether, 4.1 of chloroform, and 184.8 of absolute alcohol. With phosphomolybdic acid, a solution of 1:10000 gives a perceptible turbidity; but with mercury potassium iodide, the dilution should not exceed 1:6000 in order to produce a distinct reaction. The pure base gives no colour with either hydrochloric, nitric, or sulphuric acids, or with sulphuric acid and sugar. When mixed with minute quantities of jervine, it gives the colour-reactions described as characteristic of it by Wright and Luff. *Jervine*, $C_{14}H_{22}NO_2$, crystallizes from a boiling alcoholic solution in beautiful white needles. It melts at 237.7°, and is slightly lævogyrate. At 25°, 1 part of the base dissolves in 1658 parts of benzene, in 268 parts of absolute ether, in 60 of chloroform, and 16.8 parts of absolute alcohol. The base is insoluble in light petroleum, and very slightly soluble in ethyl acetate, water, and carbon bisulphide. Beautiful rhombic crystals of the normal hydrochloride, with 2 mols. H_2O , are obtained by mixing an alcoholic solution of the base with an alcoholic solution of hydrogen chloride; sulphuric acid gives an acid salt under like conditions. Jervine is characterized by the violet coloration, passing to blue, which it gives with sulphuric acid and sugar; veratroidine, with this test, gives a brown coloration.

The Alkaloids of the Rhizome of *Veratrum Album*. G. Salzberger. (*Archiv der Pharm.*, ccxxviii. 462-483.) Besides the

three crystallizable bases, jervine, rubijervine, and pseudojervine already known, the author has isolated two new ones, *protoveratrine*, an extremely powerful poison, and *protoveratridine*. Two methods of extraction were followed: one, the baryta method, is relatively rapid, and gives jervine, rubijervine, and protoveratridine, but no protoveratrine; the other, the metaphosphoric acid method, yields protoveratrine and pseudojervine, with small amounts of **jervine** and rubijervine. The yield varies considerably, and the method of **drying the rhizome** is not without influence on the result. The moderately pulverised **rhizome was mixed with barium hydrate** and water, and extracted with ether. The extract was freed from ether at the lowest possible temperature in a gentle current of hydrogen. The dark green syrup thus obtained gave a crop of crystals mainly consisting of jervine. Recrystallization from alcohol separated a little protoveratridine, and further treatment by Wright and Luff's process with dilute sulphuric acid yielded a small amount of rubijervine. The mother liquor from the crude jervine by further treatment yielded a little more protoveratridine and rubijervine, and other uncrystallizable and decomposition products. Protoveratrine can be easily extracted from the drug by cold water, but cannot be obtained in a crystalline form by this means. To obtain the crystalline base, the rhizome is freed from fatty and resinous compounds by treatment with ether, and then extracted with alcohol. This extract is freed from alcohol in a vacuum, mixed with much acetic acid water, quickly filtered from the insoluble residue, and treated with solid metaphosphoric acid, until no further precipitate appears. The voluminous precipitate contains much amorphous matter, besides insoluble compounds of jervine and rubijervine. The filtrate is treated with excess of ammonia, filtered and shaken up with ether; from the ether extract the protoveratrine crystallizes out after the ether is removed by distillation. By recrystallization from strong alcohol, the base is purified and separated from any remaining rubijervine and jervine. The yield was about 0.3 gram per kilo. The ammoniacal solution, after agitation with ether, was further treated with chloroform, when pseudojervine, was obtained. Since protoveratridine is not obtained by this metaphosphoric acid process, it may be inferred that this base is a decomposition product of protoveratrine.

Protoveratrine, $C_{32}H_{51}NO_{11}$, crystallizes from dilute solutions in microscopic four-sided plates, which melt with charring at 245–250°. The base is insoluble in water, benzene, and light petroleum,

somewhat soluble in chloroform and boiling 96 per cent. alcohol, almost insoluble in cold ether and slightly soluble in boiling ether. Dilute acids, with the exception of acetic acid, dissolve it. The base is exceedingly poisonous; a minute amount applied to the nostrils causes violent sneezing. Concentrated sulphuric acid dissolves the alkaloid slowly with the production of a greenish colour, which passes to blue, and after some hours becomes violet. With the same acid and sugar, the greenish colour changes to olive-green, then dirty green, and finally dark brown, differing in this respect materially from the colours yielded by veratrine. When warmed with the strong acid, the solution is first pale red, then dark cherry-red, and exhales the odour of isobutyric acid. Concentrated hydrochloric and phosphoric acids give the same reaction. Dilute solutions of salts of this base are quantitatively precipitated by ammonia; precipitates are also produced by Nessler's test, gold chloride, potassium mercuric iodide, potassio cadmium iodide, phosphotungstic acid, and picric acid, whilst no precipitate is produced by tannin, platinic chloride, or mercuric chloride. The aurochloride, a golden yellow, amorphous compound, was prepared and analysed.

Protoveratridine, $C_{26}H_{45}NO_8$, crystallizes colourless, four-sided plates, fusing at 265° . It is almost insoluble in alcohol, chloroform, methyl alcohol, and acetone, and insoluble in benzene, light petroleum, and ether. It is not poisonous, and does not cause sneezing; its solution in dilute acids has a very bitter taste. Concentrated sulphuric acid produces first a violet, then a cherry-red colour. Its solution in concentrated hydrochloric acid becomes light red on warming, and gives off a decided odour of isobutyric acid. Dilute acids readily dissolve the base, forming solutions which give crystalline precipitates with ammonia. The sulphuric acid solution gives copious precipitates with phosphotungstic, picric, and tannic acids, and with potassium mercury iodide, but none with platinic chloride, potassio cadmium iodide, or with Millon's reagent. *Protoveratridine platinochloride*, $(C_{26}H_{45}NO_8)_2 \cdot H_2PtCl_6 + 6H_2O$, was precipitated in the form of six-sided plates on adding alcohol to a mixed solution of platinic chloride and a salt of the base. Pseudojervine has been already described by Wright and Luff who give its melting point as 299° ; while the author finds it to be 300° to 307° . Jervine, $C_{26}H_{37}NO_8$, melts at 238° to 242° ; Wright and Luff found 237° . The hydrochloride, nitrate, platinochloride, and aurochloride are described. Wright and Luff's formula is confirmed, and the one given by Tobien

disproved. Rubijervine, $C_{26}H_{43}NO_2 + H_2O$, melts at 240° to 246° ; Wright and Luff found 236° . Five basic compounds have thus been determined with certainty in white hellebore root.

Sparteine. F. B. Ahrens. (*Ber. der deutsch. Chem. Ges.*, xxiv. 1095–1097). The author describes an oxidation-product of this base under the name of *oxysparteine*, to which he assigns the formula $C_{15}H_{24}N_2O$. The hydrochloride, hydrobromide, platinochloride, and aurochloride of this product are also described.

The Alkaloids of Areca Nut. E. Jahns. (*Ber. der deutsch. Chem. Ges.*, xxiii. 2972–2978; *Journ. Chem. Soc.*, 1891, 94.) The author has previously described the preparation of the two alkaloids, *arecoline*, $C_8H_{13}NO_2$, and *arecaïne*, $C_7H_{11}NO_2$, from the areca nut, and mentioned also a third substance, obtained in small quantity, the nature of which could not then be ascertained. Further investigation has shown that this compound is choline, which was identified by its *platinochloride*. The latter crystallizes from water in orange-red, anhydrous, monosymmetric plates, and not as stated by Hundeshagen, in rhombic crystals. The statement of the latter, that the platinochloride crystallizes from dilute alcohol in anhydrous, yellow octahedra, is also partially incorrect, as the crystals thus obtained contain 1 mol. of H_2O . The anhydrous compound melts with evolution of gas at 225° . *Choline aurochloride* melts at 244 – 245° .

When arecoline is heated in a sealed tube with hydrochloric acid, or boiled with hydriodic acid, potash, or baryta-water, a methyl group is eliminated, and a new compound having the composition $C_7H_{11}NO_2$ obtained. This is isomeric with arecaïne, and may therefore be termed *arecaïdine*. It is most readily prepared by means of baryta-water or hydriodic acid, and crystallizes from 60–70 per cent. alcohol in colourless, four or six-sided plates which contain 1 mol. H_2O . It loses the latter at 100° , and then melts with evolution of gas at 222 – 223° , and carbonises on further heating. It is readily soluble in water and dilute alcohol, almost insoluble in absolute alcohol, ether, chloroform, and benzene. Its solution is coloured red by a trace of ferric chloride, and, like arecaïne, which it closely resembles in other respects, it is not poisonous.

Its *platinochloride*, $(C_7H_{11}NO_2)_2, H_2PtCl_6$, crystallizes in yellow octohedra which melt at 208 – 209° with evolution of gas, and the *aurochloride*, $C_7H_{11}NO_2, HAuCl_4$, forms four-sided prisms which melt at 197 – 198° .

If finely divided arecaïdine be suspended in methyl alcohol, and

the latter saturated with hydrogen chloride, arecoline is re-formed. If ethyl alcohol be substituted for methyl alcohol, *arecaidine ethyl ether*, or *homarecoline*, $C_9H_{15}NO_2$, is obtained; this is a colourless, strongly alkaline liquid, miscible with water, alcohol, and ether, distils without decomposition, is volatile with steam, and has poisonous properties very similar to those of arecoline. Its *hydrochloride* crystallizes in very hygroscopic needles which deliquesce in the air. The other salts are also deliquescent, and cannot be obtained in crystals. The *picrate* is an amorphous resinous mass, and the *aurochloride* an oily liquid, sparingly soluble in cold, readily in hot water. The *plantinoclchloride* forms an orange-red, amorphous mass which has the composition $(C_9H_{15}NO_2)_2H_2PtCl_6$, and commences to decompose at 100° .

The above reactions show that arecaidine is a monobasic acid, and that both oxygen atoms are present as carboxyl. This is confirmed by the fact that no acetyl derivatives of arecaidine can be obtained, which should be readily formed if the oxygen were present as hydroxyl. The formula for arecoline may therefore be partially resolved into $C_6H_{10}N \cdot COOMe$.

Alkaloidal Constituents of the Pea and Vetch. E. Schulze. (*Pharm. Journ.*, from *Zeitschr. physiol. Chem.*, January, 1891, 140.) The author has examined the seeds of *Vicia sativa* and *Pisum sativum* and found in the alcoholic extract of the former choline, betaine, and a third unidentified base, as well as the vicine of Ritthausen, whilst from the latter he has isolated choline and a base resembling but not identical with betaine. The quantity of choline observed, 0.02 per cent. in vetches and 0.04 in peas, is not considered by the author, however, to be sufficient to render feeding with these seeds unhealthy. He has also endeavoured to ascertain whether choline and betaine exist in the plant, as such, or are derived from the decomposition of other bodies during the process of extraction, and as neither lecithine nor any body yielding betaine by its decomposition could be isolated, concludes that these bases probably occur as salts of organic acids.

The Alkaloids of Corydalis Cava. F. Adermann. (*Amer. Journ. Pharm.*, August, 1890.) The author has ascertained that the alkaloid previously described as *corydaline* consists of three or four distinct alkaloids, one of which has properties and composition closely analogous to *hydroberberine*. It forms colourless crystals which, in contact with light, turn yellow, are freely soluble in chloroform and benzol, and dissolve in 1 part of strong alcohol,

in 28 parts of ether, sp. gr. 0.782, in 35 parts of absolute ether, in 326 parts of petroleum benzin, and in 4792 parts of water. It has the composition $C_{20}H_{23}NO_4$, melts at $138^\circ C.$, and has no characteristic colour reactions. Fröhde's reagent colours transiently green, and most oxidising agents produce a yellowish-red colour. On boiling the alcoholic solution it turns yellow, and then contains *berberine*, which is also produced by careful treatment of the solution with chromic acid. Berberine is present in notable proportion in the chloroform solution of the crude alkaloids, and since the fresh tuber has a yellow colour, this alkaloid doubtless exists ready formed in the plant, and more of it is likely to be produced during the process of isolating the hydroberberine-like alkaloid. An alkaloid for which the author proposes to retain the name *corydaline*, crystallizes in long, soft needles of a silky lustre, turning greyish green in contact with light and with alkalies. Its composition agrees with the formula $C_{22}H_{21}NO_4$. The alkaloid, like the first one, is somewhat dextrorotatory. Corydaline requires for solution 198 parts of ether, 338 parts of absolute ether, 150 parts of strong alcohol, 45.5 parts of benzol and 7064 parts of water. The salts are intensely bitter and crystallize readily. Sulphuric acid produces a yellowish colour, changing to a splendid violet. Violet colours are also produced by Fröhde's reagent, by selenosulphuric acid, and by sulphuric acid containing nitrate or chromate; the latter reaction resembles that with strychnine, but the colour is more of a reddish tint and disappears more rapidly. *Fumarine* shows a similar behaviour, and is probably closely related to corydaline. The amorphous base was present in the tuber only in small quantity, and its purity could not be established. Sulphuric acid, with the addition of a little nitrate, generated the odour of bitter almonds.

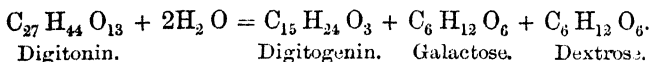
A New Class of Organic Bases. C. Stoehr. (*Journ. prakt. Chem.* [2], xliii. 156-160.) Besides the pyridine bases previously described by the author, he has now obtained by the action of ammonium salts on glycerine a new series of bases of the general formula $C_nH_{2n-4}N_2$, which may be regarded as homologues of the diamine $C_4H_4N_2$. One of these bases is a colourless strongly refractive liquid of the composition $C_6H_8N_2$, boiling at $154^\circ C.$, and having an odour resembling that of nicotine. It is equally soluble both in hot and cold water, but otherwise possesses all the properties of a pyridine base. A second base, $C_8H_{12}N_2$ was also isolated. In both cases the auro- and platinochlorides are described.

Isobutylamine. H. Malbot. (*Comptes rendus*, cxi. 528, 529.) The author states that in the reaction of isobutyl chloride with ammonia, the largest yield of isobutylamine is obtained when 1 molecule of the former is heated with 15 molecules of the latter for a period of 3 to 3½ days.

Ptomaines. O. de Coninck. (*Comptes rendus*, cx. 1339-1341.) The ptomaine $C_{10}H_{15}N$ is a yellowish, viscous liquid with an agreeable odour; it is heavier than, and only slightly soluble in, water, but dissolves readily in ether, absolute alcohol, acetone, and light petroleum. After being dried over fused potash, it boils at about 230° with partial decomposition. It oxidises rapidly in presence of oxygen or air, becomes brown, and forms a thick resin soluble in acids. The *hydrochloride* is obtained by saturating the base with hydrochloric acid and concentrating rapidly in a vacuum. It forms yellowish needles which are highly deliquescent and very soluble in water. In presence of a very small quantity of air, the crystals acquire a rose colour, and with larger quantities of air they become brown and form a resinous product identical with that obtained by direct oxidation of the base. The *platinochloride* is a deep red solid insoluble in cold water, very soluble in warm water, and decomposed by boiling water. It is permanent in dry air, but in moist air loses hydrogen chloride, and is partially oxidised.

Digitonin and Digitogenin. H. Kiliani. (*Ber. der deutsch. chem. Ges.*, xxiii. 1555-1560; *Journ. Chem. Soc.*, September, 1890.) According to Schmiedeberg, commercial digitalin contains, in addition to digitoxin, its most important pharmacological constituent, three glucosides, namely, digitonin, digitalin, and digitaleïn. When heated with dilute acid, it yields a substance which reduces Fehling's solution, and also a crystalline compound insoluble in water, which Schmiedeberg named digitogenin. The author dissolved 1 part of commercial digitalin in 10 parts of water, added 1 part of concentrated hydrochloric acid (sp. gr. 1.19), and heated the mixture for six hours on the water-bath. By this means, a solution and a light grey precipitate were obtained. The solution contained about equal quantities of two glucoses, which were identified by means of the melting points of their osazones, and their behaviour when oxidised, as galactose and dextrose respectively. The precipitate of digitogenin was crystallized from alcohol, and found to be rather more than equal in amount to either of the two glucoses. It has the constitution $(C_6H_8O)_x$, probably

$C_{15}H_{24}O_3$. Digitonin has, therefore, very probably the composition $C_{27}H_{44}O_{13}$, and its hydrolysis is expressed by the equation—



This would require a ratio of 1·4 : 1 : 1 between the weights of digitogenin, galactose, and dextrose formed; that actually found is more nearly 1 : 1 : 1, but it must be remembered that at the moment of hydrolysis digitogenin is much more easily attacked than galactose and dextrose, and very readily yields resinous products. An analysis of the raw material agreed well with the formula $C_{27}H_{44}O_{13}$; not so, however, did Schmiedeberg's analysis.

Digitogenin.—The following details may be added to Schmiedeberg's data regarding this substance. One part requires for solution 35 parts of boiling or 100 parts of cold 93 per cent. alcohol, and 20 parts of boiling or 30 parts of cold chloroform, and 30 parts of cold glacial acetic acid; it is insoluble in water and aqueous alkalies. It seems to form a compound containing chloroform of crystallization, which loses its chloroform only very slowly at 110°. With alcoholic potash, it forms a crystalline potassium compound, strongly alkaline, and little soluble in alcohol. It forms no stable compounds with barium hydroxide or phenylhydrazine, but is attacked by mineral acids and oxidising agents.

Digitonin and Digitogenin. H. Kiliāni. (*Ber. der deutsch. chem. Ges.*, xxiv. 339–347.) The author has shown in a former communication (preceding abstract) that pure commercial digitalin, when heated with dilute hydrochloric acid, gives, besides dextrose and galactose, a large quantity of digitogenin, $C_{15}H_{24}O_3$.

Digitonin is best obtained from commercial digitalin by extraction with 85 per cent. alcohol. 1 part of digitalin is dissolved in 4 parts of 85 per cent. alcohol at 50–60°, and the solution allowed to crystallize slowly. The crude product thus obtained is dissolved in 12 times its weight of boiling alcohol (85 per cent.), heated for two minutes with animal charcoal, and filtered: by stirring the filtrate while it cools, the product is obtained in aggregates of slender needles. The crystals are, however, more compact and the product purer if the solution is allowed to cool very slowly without the stirring. Digitonin crystallizes easily from 85 per cent. alcohol, whilst from stronger alcohol it is only obtained in the amorphous state; it begins to soften at 225°, is completely melted at 235°, and is lævorotatory; for a 2·8 per cent. solution in 75 per cent. acetic acid, $[\alpha]_D = -50^\circ$. The amorphous digitonin of

Schmiedeberg dissolves in cold water in all proportions; the crystalline substance is sparingly soluble in water; on heating, it dissolves more easily, but does not crystallize on cooling, and the solution always shows an opalescence. With concentrated sulphuric acid, it gives a red solution; the addition of a drop of bromine-water greatly intensifies the reaction. Concentrated hydrochloric acid gives a colourless solution which, after a time or on heating, turns yellow, and then red. Heated with dilute hydrochloric acid under the same conditions as were before given for digitalin, it yields nearly the calculated quantities of digitogenin, dextrose, and galactose. The digitogenin obtained in this way was identical in every respect with that formerly obtained from digitalin.

The author also describes a number of derivatives of digitogenin, viz. *acetyldigitogenin*, $C_{15}H_{23}O_3Ac$, *digitogenic acid*, $C_{14}H_{22}O_4$, *oxydigitogenic acid*, $2C_{14}H_{20}O_4 + H_2O$, and *digitic acid*, $C_{10}H_{16}O_4$.

Santoninoxime and its Derivatives. P. Gucci. (*Gazz. Chim. Ital.*, xix. 367-382. From *Journ. Chem. Soc.*) Santoninoxime, $C_{15}H_{19}NO_3$, was first obtained by Cannizzaro. It is best prepared by boiling a mixture of santonin (5 parts), hydroxylamine hydrochloride (4 parts), alcohol (50 parts), and precipitated calcium carbonate (3-4 parts) for 6-7 hours on the water-bath, and adding an excess of boiling water to the clear solution. The yield is 80 per cent. of the santonin employed. It crystallizes from alcohol in white, lustrous needles which melt at $216-219^\circ$ with incipient decomposition, dissolves readily in alcohol and ether, but only very sparingly in boiling water, which, however, has no chemical action on it; it dissolves in hot solutions of the alkaline hydrates and carbonates, forming colourless solutions, from which it is precipitated unchanged on the addition of an acid. It is only very partially resinified by boiling with acetic acid, or dilute sulphuric acid, or concentrated hydrochloric acid, and the solution treated in this way has no reducing action on Fehling's solution. It is split up into its constituents on warming with very dilute hydrochloric acid, the santonin being quantitatively reproduced.

The *acetyl-derivative*, prepared by the action of acetic chloride or anhydride on the oxime, crystallizes in minute needles which change in colour on heating to 70° , and decompose at $201-203^\circ$. It is soluble in warm glacial acetic acid, but is almost insoluble in the cold in that solvent and in alcohol, ether, benzene, etc. It dissolves in hot baryta-water, and on treating the solution with carbonic anhydride, filtering, and acidifying, the oxime is repre-

cipitated in a state of great purity. The pure oxime so prepared is lævogyrate, the specific rotatory power being $[\alpha]_D = -80.83$; for the crude oxime $[\alpha]_D = -82.47$.

The molecular weight of the oxime was confirmed by Raoult's method. The mother liquors from the oxime obtained in the ordinary way (from hydroxylamine and sodium acetate) also contain a substance which crystallizes from absolute alcohol in thin, white aggregates which change colour at 210° and decompose at $228-231^\circ$. When sodium amalgam is gradually added to a solution of the oxime (20 grams) in 50 per cent. acetic acid ($2\frac{1}{2}$ litres), care being taken that the temperature does not rise above 50° , and the cold solution treated with ether, the extract only contains some acetic acid and resinous matters; the aqueous solution, however, after being heated to remove the ether, and concentrated in a vacuum, yields a deposit of iridescent plates and slender needles which may be separated by fractional crystallization from 90 per cent. alcohol. The first deposit obtained is repeatedly crystallized from alcohol, and forms large, iridescent plates which melt at $152-153^\circ$; the subsequent deposit, similarly treated, yields opaque, white crystals which melt at $167.5-168.5^\circ$. These substances are isomerides, and have the molecular formula $C_{15}H_{18}O_2$; the isomeride crystallizing in plates is produced alone if during the preparation heating is discontinued as soon as the crystallization commences and the solution is then strongly agitated; protracted heating, on the other hand, leads to the formation of an excess of the second isomeride; this conversion may be directly effected by heating the plates with dilute acetic acid at 100° . Acetic anhydride has no action on either of the isomerides; hot solutions of the alkalis dissolve them both, and on prolonged heating the substance melting at $152-153^\circ$ is converted into its isomeride. The former is dextrogyrate, $[\alpha]_D = +30.75$; the latter is lævorotatory, $[\alpha]_D = -73.73$.

Lupeol. A. Likiernik. (*Ber. der deutsch. chem. Ges.*, xxiv. 183-186.) The husks and seeds of *Lupinus luteus* yield to ether a crystallizable constituent answering to the formula $C_{26}H_{42}O$, to which the name lupeol is given. This forms long, colourless needles which melt at $204^\circ C.$, and are insoluble in water, but readily soluble in chloroform, ether, benzol, and light petroleum. It forms crystallizable compounds with acetic and benzoic acids, and is converted into a bromo-derivative, $C_{26}H_{41}BrO$, on treating its chloroform solution with bromine.

Lupeol is extracted from the ethereal tincture of the husks by

evaporating, hydrolysing the residue with alcoholic potash, dissolving in water, and shaking the solution with ether, which takes up the lupeol. After evaporation of the ether it is recrystallized from dilute alcohol.

Vanillin from *Rosa Canina*. A. Schneegans. (*Journ. de Pharm. et de Chim.* [5], xxii. 115.) The author obtained from the seeds of *Rosa canina* a very small proportion (1 from 10,000) of a crystallizable substance which he found to be identical with vanillin.

Brazilin. C. Schall and C. Dralle. (*Ber. der deutsch. chem. Ges.*, xxiii. 1428-1437.) This paper contains a description of a considerable number of bromo- and bromoacetyl-derivatives of brazilin, for which reference should be made to the original. It is also shown that brazilin, when dissolved in glacial acetic acid and treated with an equal molecular proportion of potassium nitrite, is readily converted into brazileïn.

The Tannins of *Algarobilla* and of *Myrobalans*. G. Zoelfell. (*Archiv der Pharm.*, 1801, 123-160; *Amer. Journ. Pharm.*, May 1891.) The tannin of *Algarobilla* (the fruit of *Cæsalpinia brevifolia*), is a mixture of two tannins; one of which (present to the extent of 8-10 per cent.) is the glucoside of gallic acid, yielding upon hydrolysis gallic acid and sugar (dextrose); the other tannin present in much larger quantity is a tannic acid proper of the formula $C_{14}H_{10}O_{10}$, which at $100^{\circ}C$. easily loses two molecules of water. The anhydrous acid $C_{14}H_6O_8$ is called *ellagic acid* (the formula of which is generally given $C_{14}H_8O_9$); the hydrated acid $C_{14}H_{10}O_{10}$ is called *ellagenic acid*; the latter forms a penta-acetyl derivative, the former a tetra-acetyl derivative, indicating five and four hydroxyl groups, respectively, in the acids. In the fruit there also pre-exist small quantities of gallic and oxalic acids.

The tannin of *Myrobalans* is also a mixture of the two tannins mentioned above, although in somewhat different proportions; gallic acid in small quantity is also present. The tannins were separated by fractional precipitation with lead acetate, subsequently purified by precipitation with sodium chloride and solution in acetic ether.

Gallic Acid, Tannin, and Oak-Tannin. C. Böttinger. (*Liebig's Annalen*, cclviii. 252-260, and cclix. 132-136; *Journ. Chem. Soc.*, November, 1890, 1275.) When sodium is gradually added to an alcoholic solution of anhydrous gallic acid, a blue colour is produced where the metal comes in contact with the liquid, but the colour soon disappears again, and a basic salt of gallic acid is

deposited. An alcoholic solution of tannin, under the same conditions, gives first a greenish blue coloration, and then a yellowish precipitate, the tannin being converted into gallic acid.

When sodium is added to a boiling amyl alcoholic solution of anhydrous tannin, the portions of the liquid in contact with the metal are coloured greenish blue, and then a yellowish precipitate is produced, part of the tannin being converted into an amyl-derivative and part of it decomposed into gallic acid.

The acetyl-derivative of oak-tannin under the same conditions is decomposed into acetic acid, oak-tannin, and the amyl-derivative of the last-named compound. In ethyl acetate solution, tannin and tannin-derivatives of this ethereal salt are formed, together with small quantities of gallic acid.

The author's attempts to prepare cyanhydrins and oximes from gallic acid and various tannins were unsuccessful, and no definite results were obtained.

Tannin Extracts. C. Böttinger. (*Liebigs Annalen*, cclix. 125-132.) The following extracts were examined: Sumach, valonia, algarobilla, divi-divi, oak-wood, oak-bark, and pine-bark. On boiling an aqueous solution of any of these extracts with phenylhydrazine, carbonic anhydride is evolved, probably also nitrogen, and the phenylhydrazine is partially decomposed into ammonia and azobenzene, so that ammonia-derivatives, as well as phenylhydrazine-derivatives of the tannins, are formed.

Manufacture of Decolorised Tannins. A. Villon. (*Bull. de la Soc. Chim.* [3], iii. 784-786.) The liquor obtained by exhausting the crude material in the ordinary way is cooled at 2° for half an hour, and after filtering off extractives and tannins insoluble in the cold, 0.5 per cent. of zinc sulphate is added. The tannin of the liquor is now titrated, and for each kilo. present in the solution, 2.5 kilos. of zinc sulphate, dissolved in 12.5 litres of water, is added, and the whole is placed in a closed vat, furnished with a mechanical stirrer and steam coil, into which is passed the ammonia resulting from the decomposition of 2.5 kilos. of ammonium sulphate per kilo. of tannin present. After separation by a filter press of the precipitated zinc tannate, it is decomposed by dilute sulphuric acid, and to the liquor barium sulphide is added, until the zinc sulphate is completely precipitated as zinc sulphide and barium sulphate. On filtration, a liquor containing 20-30 per cent. of tannin, and almost free from colour, is obtained. The process is economical, since all the bye-products are capable of easy regeneration.

Oxidation Products of Tannic and Gallic Acids and Oak Tannins.

C. Böttlinger. (*Liebig's Annalen*, cclvii. 248-252.) When oak-bark-red or oak-red is treated with cold very dilute nitric acid, carbonic anhydride is evolved, and after some time the reaction becomes so energetic that the mixture must be cooled with water. If the solution thus obtained is evaporated, rapid oxidation ensues, and there remains a mixture of oxalic acid and various other acids, which can be separated by means of their calcium salts. The quantity of the calcium salts (excluding calcium oxalate) thus obtained is only about 6 per cent. of the material employed.

The acetyl-derivative of oak-wood tannin gives identical oxidation-products. Tannin and gallic acid, on oxidation with nitric acid, also yield compounds other than oxalic acid and carbonic anhydride. After removing the oxalic acid as completely as possible and treating the residue with calcium carbonate, a readily soluble and a very sparingly soluble calcium salt are obtained. The latter contains 16.39 per cent. of calcium, and seems to be calcium trihydroxyglutarate ($+H_2O$); the latter contains 12.4 per cent. of calcium, and is probably calcium trihydroxybutyrate. A calcium salt, which seems to be that of trihydroxybutyric acid, was also isolated from the oxidation-products of oak-bark-red, oak-red, and the acetyl-derivative of oak-bark tannin.

Artificial Musk. A. Baur. (*Comptes rendus*, cxi. 238-240.) The preparation described by the author under the above name is trinitrobutyltoluene, and is prepared from metaisobutyltoluene by repeated and prolonged treatment with a mixture of sulphuric and fuming nitric acids at the heat of a water-bath. It is a non-nitrogenous resin having a strong musk-like odour, perceptible even in very weak solutions. It is spoken of as a suitable substitute for real musk in perfumery.

A Violet Colouring Matter Derived from Morphine. P. Caze-neuve. (*Comptes rendus*, April 13, 1891; *Chem. News*, May 8, 1891.) The action of paranitrosodimethylaniline ether upon the phenols or the aromatic amines leads to the formation of indophenols and safranines. With morphia the same reaction leads to the formation of an azine or more probably an indamine. It is a fine violet colour of a definite composition. The author boils for 100 hours in an apparatus furnished with an ascending condenser 7 grms. of morphine and 5 grms. of paranitrosodimethylaniline, in 500 grms. of methylic or ethylic alcohol. The compound obtained is amorphous, sparingly soluble in water, very soluble in the methylic, ethylic, and amylic alcohols, in which it shows a well-marked

dichroism. It is red by reflected, but violet by transmitted light. It dyes wool, silk, and gun-cotton, a bright violet which is not permanent in light. This violet is conjectured to be the first colour derived from a natural alkaloid.

The Chemistry of Organic Dyes. F. W. Passmore. (*Pharm. Journ.*, 3rd series, xxi. 504-506, 547-551, and 567-569.) The author supplies a very useful and interesting summary of the chemistry of the more important organic dyes now in use. As the paper is not suited for abstraction, and too voluminous for entire reproduction in this volume, we cannot do more in this place than recommend it to the reader's attention and refer him to the above source.

New Synthesis of Indigo. L. Lederer. (*Journ. prakt. Chem.* [2], xlii. 383.) 2 grams of anilidoacetic acid (phenylglycocine) are slowly added, with stirring, to 8-10 grams of fused sodium hydrate; the fusion is maintained until the pale yellow colour has changed to a pure orange. Upon dissolving the cooled mass in a very large quantity of water, the indigo is separated.

New Synthesis of Indigo. K. Heumann. (*Journ. prakt. Chem.* [2], xlii. 520.) The author claims priority as to the method for the synthesis of indigo published by Lederer (preceding abstract), for which he (Heumann) has obtained a patent. One part of phenylglycocine is fused with two parts of sodium or potassium hydrate; at 260° C. the fused mass assumes a dark orange colour. If the resulting product be now dissolved in water, without access of air, a yellow solution is obtained which, on exposure to air, or on the addition of ferric chloride and hydrochloric acid, precipitates the indigo. In opposition to Lederer, the author states that the indigo in this case is only formed by oxidation from a substance of the nature of indigo-white present in the product of the fusion, and that no indigo-blue exists as such in the fused mass.

Synthesis of Indigo from Anilidoacetic Acid (Phenylglycocine). L. Lederer. (*Journ. prakt. Chem.* [2], xlii. 565-567.) The author disputes Heumann's claim for priority with regard to this synthesis (see preceding abstract). In reply to Heumann's statement that indigo cannot actually exist in the fused mass, he points out that the fusion of indigotin with sodium hydrate, like that of phenylglycocine with sodium hydrate, yields first a yellow and afterwards an orange-red mass, from which indigo-blue is reproduced upon treatment with dilute sulphuric acid.

Sulphines. G. Patein. (*Bull. de la Soc. Chim.* [3], iii. 164-171.) The following double salts, which exist as crystalline, deliquescent masses, are described:— $\text{SMe}_3 \cdot \text{CN}$, Ag CN , melting at $145-146^\circ$; $\text{SEt}_3 \cdot \text{CN}$, Ag CN , melting at $25-26^\circ$; $\text{SMe}_2 \text{Et} \cdot \text{CN}$, Ag CN , melting at $78-79^\circ$; and $\text{SMeEt}_2 \cdot \text{CN}$, Ag CN , melting at $45-46^\circ$.

Piperazidine as a Solvent of Uric Acid. (*Pharm. Journ.*, 3rd series, xxi. 557.) Piperazidine, or piperazine, also known as Ladenburg and Abel's diethylenediimine, $\text{C}_4\text{H}_8(\text{NH})_2$, the preparation which has been recently offered in commerce as "synthetical spermine," is stated to possess to a remarkable degree the power of dissolving uric acid. Dissolved in cold water, in which piperazidine is soluble in all proportions, it is said to be capable of dissolving twelve times as much uric acid as an equal quantity of lithium carbonate. Piperazidine urate, obtained by boiling piperazidine with excess of uric acid, is described as being seven times more soluble than lithium urate in water at 17°C ., the respective solubilities being 1 in 50 and 1 in 368. Even in presence of great excess of uric acid an acid salt is not formed, but only the neutral salt, $\text{C}_4\text{H}_8(\text{NH})_2 \cdot \text{C}_5\text{H}_4\text{N}_4\text{O}_3$, as from the constitution of the compound might be expected.

Identity of Piperazidine with Diethylenediamine. A. W. v. Hofmann. (*Ber. der deutsch. chem. Ges.*, xxiii. 3297-3303.) The author reports that the commercial product termed piperazidine, or piperazine, "Ladenburg's ethyleneimine" (diethylene-diimine), and "synthetical spermine," is identical with diethylenediamine obtained by him some time ago as the product of a reaction between ammonia and ethylene chloride.

Spermine and Piperazine (Piperazidine). W. Majert and A. Schmidt. (*Ber. der deutsch. chem. Ges.*, xxiv. 241-243.) The authors have carried out a direct comparison of spermine and piperazine, and find that although there is great similarity between the two bases and some of their salts, they are not identical, the bismuthiodides and the phosphates showing distinct differences.

Spermine. A. Poehl. (*Ber. der deutsch. chem. Ges.*, xxiv. 359, 360.) The author has prepared this base by a method analogous to that employed by Schreiner and confirms the latter's statements as to the properties of this base. The analyses of the platinochloride and aurochloride, however, gave results leading to the formula $\text{C}_{10}\text{H}_{26}\text{N}_4$, which does not agree with Schreiner's formula ($\text{C}_2\text{H}_5\text{N}$). Spermine is, therefore, neither identical nor isomeric with piperazine.

Microcidine. M. Berlioz. (*Nouv. Rem.*, May 8, 209; *Pharm. Journ.*, 3rd series, xxi. 1067.) The author calls attention to a new antiseptic, to which he has given the name "microcidine." He describes it as being prepared by adding to melted β -naphthol half its weight of caustic soda, and the whitish powder obtained on cooling of the mixture is said to "consist in great part of naphthalate of soda and for the remainder of naphthalic and phenolic compounds." Microcidine is represented as being soluble in water, concentrated solutions being brownish and dilute solutions nearly colourless. In antiseptic power it is admitted to be inferior to mercuric chloride and naphthol, though ten times more powerful than carbolic acid, but on the other hand its toxicity is claimed to be lower than that of naphthol and incomparably less than that of mercuric chloride. The author states that he has found a 3 per cent. solution very useful in his clinic.

Antipyrine and Mercuric Chloride. M. Petsche. (*Pharm. Rundschau*, February, 1891. From *Pharm. Journ.*) The author states that upon mixing cold aqueous solutions of antipyrine and mercuric chloride a white precipitate is formed. This disappears upon heating the liquid to boiling, but after keeping it at that temperature for a time a brown resin-like substance is deposited, which, when separated, dissolves in nitric acid and is coloured scarlet by sulphuric acid. This resinoid substance dissolves in boiling alcohol, and is partially deposited again from the liquid on cooling. The insoluble portion when dried yields a reddish-yellow powder, acid in reaction and bitter in taste. When heated on platinum foil it melts and takes a scarlet colour before charring. It dissolves in nitric acid and the yellow solution becomes scarlet when sulphuric acid is added, but upon being heated turns yellow again, and eventually evaporates with a white fume, leaving no residue. With hydrochloric acid it gives a yellow solution that becomes red upon being heated, and leaves a yellow residue upon evaporation. A solution in hot alcohol gives a white precipitate with ammonia water, but not with water acidulated with hydrochloric acid. The portion of the original resinoid substance soluble in cold alcohol is obtained upon evaporation as a white readily powdered resin, acid in reaction, and very bitter, and giving colour reactions very similar to those of the insoluble resin. It differs, however, in dilute hydrochloric acid throwing down a white precipitate from an alcoholic solution.

Resopyrine. L. Portes. (*Pharm. Journ.*, 3rd series, xxi. 758.) The author calls attention to a compound of resorcin with

antipyrine, to which the name "resopyrine" has been given. The compound crystallizes in colourless rhombic prisms, soluble in alcohol and insoluble in water. It is obtained by mixing solutions of the constituents in proportions corresponding to their chemical equivalents.

Iodophenine. L. Scholvien. (*Pharm. Centralhalle*, 1891, 311; *Amer. Journ. Pharm.*, July, 1891.) This new derivative of phenacetin is obtained by adding solution of iodine in potassium iodide to a hydrochloric acid solution of phenacetin. It is generally prepared by dissolving 600 grams of phenacetin in 5 kilograms of glacial acetic acid, adding a solution of 900 grams of hydrochloric acid in 3 kilograms of water, and, lastly, a solution of 680 grams of iodine in 1,360 grams of potassium iodide and 1,360 grams of water; if the phenacetin solution be used warm, upon cooling the new compound separates in crystals closely resembling potassium permanganate. Iodophenine possesses a faint iodine-like odour, has a burning taste, and colours the skin yellow; it is soluble in glacial acetic acid and in alcohol; insoluble or nearly so in water, in benzol, chloroform, and 50 per cent. acetic acid. The iodine is very easily liberated, heating alone or boiling with water accomplishing this; it contains 51 per cent. of iodine and has given encouraging results as an antiseptic and a febrifuge.

Note on the Constitution of certain Antipyretics and Allied Bodies. A. H. Allen. (*Pharm. Journ.*, 3rd series, xxi. 62.) The following tables compiled by the author place in a very interesting light the constitution of the derivatives of pyrrol recently proposed as antipyretics.

Piazine. $N \{ \begin{smallmatrix} \cdot CH \cdot CH \cdot \\ \cdot CH \cdot CH \cdot \end{smallmatrix} \} N$ Piazine Dihydride. $N \{ \begin{smallmatrix} \cdot CH \cdot CH \cdot \\ \cdot CH_2 \cdot CH_2 \cdot \end{smallmatrix} \} N$ Piazine Hexahydride. (Diethylene-Diamine.) $HN \{ \begin{smallmatrix} \cdot CH_2 \cdot CH_2 \cdot \\ \cdot CH_2 \cdot CH_2 \cdot \end{smallmatrix} \} NH$ Quinone. $CO \{ \begin{smallmatrix} \cdot CH \cdot CH \cdot \\ \cdot CH \cdot CH \cdot \end{smallmatrix} \} CO$	Pyridine. $N \{ \begin{smallmatrix} \cdot CH \cdot CH \cdot \\ \cdot CH \cdot CH \cdot \end{smallmatrix} \} CH$ Pyridine Dihydride. $N \{ \begin{smallmatrix} \cdot CH \cdot CH \cdot \\ \cdot CH_2 \cdot CH_2 \cdot \end{smallmatrix} \} CH$ Piperidine. $HN \{ \begin{smallmatrix} \cdot CH_2 \cdot CH_2 \cdot \\ \cdot CH_2 \cdot CH_2 \cdot \end{smallmatrix} \} CH_2$ Pyrone. $O \{ \begin{smallmatrix} \cdot CH \cdot CH \cdot \\ \cdot CH \cdot CH \cdot \end{smallmatrix} \} CO$	Pyrrol. $HN \{ \begin{smallmatrix} \cdot CH \cdot CH \cdot \\ \cdot CH \cdot CH \cdot \end{smallmatrix} \}$ Pyrrolidine. $HN \{ \begin{smallmatrix} \cdot CH \cdot CH \cdot \\ \cdot CH_2 \cdot CH_2 \cdot \end{smallmatrix} \}$ Pyrrolidine. $HN \{ \begin{smallmatrix} \cdot CH_2 \cdot CH_2 \cdot \\ \cdot CH_2 \cdot CH_2 \cdot \end{smallmatrix} \}$ Pyridone. $HN \{ \begin{smallmatrix} \cdot CH \cdot CH \cdot \\ \cdot CH \cdot CH \cdot \end{smallmatrix} \} CO$	Pyrazol. $HN \{ \begin{smallmatrix} \cdot N \cdot CH \cdot \\ \cdot CH \cdot CH \cdot \end{smallmatrix} \}$ Pyrazoline. $HN \{ \begin{smallmatrix} \cdot N \cdot CH \cdot \\ \cdot CH_2 \cdot CH_2 \cdot \end{smallmatrix} \}$ Pyrazine. $HN \{ \begin{smallmatrix} \cdot NH \cdot CH_2 \cdot \\ \cdot CH_2 \cdot CH_2 \cdot \end{smallmatrix} \}$ Pyrazolone. $HN \{ \begin{smallmatrix} \cdot N \cdot CH \cdot \\ \cdot CO \cdot CH_2 \cdot \end{smallmatrix} \}$
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Piazine has only a hypothetical existence, and the dihydride is known only through its diphenyl-derivative. Pyrone, pyrazol and pyrazine also are only known by their derivatives.

Pyrrol is closely related to *thiophene*, which itself has the con-

stitution of a *thiofurfuran*. Many of the reactions of pyrrol are common to thiophene, and are also produced by *carbazol*, which has the constitution of an imido-diphenyl. Indole holds a position intermediate between pyrrol and carbazol. Thus:—

<i>Pyrrol.</i> $\text{HN} \left\{ \begin{array}{c} \cdot \text{CH} : \text{CH} \cdot \\ \cdot \text{CH} : \text{CH} \cdot \end{array} \right\}$ <i>Furfuran.</i> $\text{O} \left\{ \begin{array}{c} \cdot \text{CH} : \text{CH} \cdot \\ \cdot \text{CH} : \text{CH} \cdot \end{array} \right\}$ <i>Thiophene.</i> $\text{S} \left\{ \begin{array}{c} \cdot \text{CH} : \text{CH} \cdot \\ \cdot \text{CH} : \text{CH} \cdot \end{array} \right\}$	<i>Indole.</i> $\text{HN} \left\{ \begin{array}{c} \cdot \text{CH} : \text{CH} \cdot \\ \cdot \text{C}_6\text{H}_5 \cdot \end{array} \right\}$ — <i>Thionaphthene.</i> $\text{S} \left\{ \begin{array}{c} \cdot \text{CH} : \text{CH} \cdot \\ \cdot \text{C}_6\text{H}_4 \cdot \end{array} \right\}$	<i>Carbazol.</i> $\text{HN} \left\{ \begin{array}{c} \cdot \text{C}_6\text{H}_5 \cdot \\ \cdot \text{C}_6\text{H}_5 \cdot \end{array} \right\}$ <i>Diphenylene Oxide.</i> $\text{O} \left\{ \begin{array}{c} \cdot \text{C}_6\text{H}_5 \cdot \\ \cdot \text{C}_6\text{H}_5 \cdot \end{array} \right\}$ —
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Iodol is a tetra-iodopyrrol:— $\text{HN} \left\{ \begin{array}{c} \cdot \text{CI} : \text{CI} \cdot \\ \cdot \text{CI} : \text{CI} \cdot \end{array} \right\}$

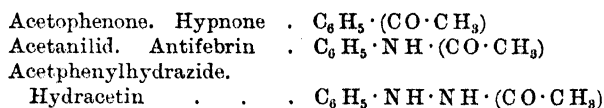
The relationship of antipyrine (now proposed to be added to the Pharmacopœia under the name of *phenylon*), kairine, thalline, and thermofugin to the pyrazol group is shown by the following formulæ:—

<i>Pyrazolone.</i> $\text{HN} \left\{ \begin{array}{c} \cdot \text{N} : \text{CH} \cdot \\ \cdot \text{CO} \cdot \text{CH}_2 \cdot \end{array} \right\}$ <i>Phenyl-dimethyl-pyrazolone</i> <i>(Isomer of Antipyrine).</i> $(\text{C}_6\text{H}_5)\text{N} \left\{ \begin{array}{c} \cdot \text{N} : \text{C}(\text{CH}_3) \cdot \\ \cdot \text{CO} \cdot \text{CH}(\text{C}_6\text{H}_5) \cdot \end{array} \right\}$ <i>Antipyrine.</i> $(\text{C}_6\text{H}_5)\text{N} \left\{ \begin{array}{c} \cdot \text{N}(\text{CH}_3) \cdot \text{C}(\text{CH}_3) \cdot \\ \cdot \text{CO} \cdot \text{CH} \cdot \end{array} \right\}$	<i>Pyrazoline.</i> $\text{HN} \left\{ \begin{array}{c} \cdot \text{N} : \text{CH} \cdot \\ \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \end{array} \right\}$ <i>Pyroglutamic Acid.</i> $\text{HN} \left\{ \begin{array}{c} \cdot \text{CH}(\text{CO} \cdot \text{OH}) \cdot \text{CH}_2 \cdot \\ \cdot \text{CO} \cdot \text{CH}_2 \cdot \end{array} \right\}$ <i>Pyrazine.</i> $\text{HN} \left\{ \begin{array}{c} \cdot \text{NH} \cdot \text{CH}_2 \cdot \\ \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \end{array} \right\}$	<i>Pyrazine.</i> $\text{HN} \left\{ \begin{array}{c} \cdot \text{NH} \cdot \text{CH}_2 \cdot \\ \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \end{array} \right\}$ <i>M-Kairine.</i> $\text{C}_6\text{H}_5(\text{OH}) \left\{ \begin{array}{c} \cdot \text{N}(\text{CH}_3) \cdot \text{CH}_2 \cdot \\ \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \end{array} \right\}$ <i>Thalline.</i> $\text{C}_6\text{H}_5(\text{COH}) \left\{ \begin{array}{c} \cdot \text{N}(\text{CH}_3) \cdot \text{CH}_2 \cdot \\ \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \end{array} \right\}$ <i>Thermofugin.</i> $\text{C}_6\text{H}_5(\text{CO} \cdot \text{ONa}) \left\{ \begin{array}{c} \cdot \text{N}(\text{CH}_3) \cdot \text{CH}_2 \cdot \\ \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \end{array} \right\}$
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The formulæ of *acetanilid* and its derivatives, although not allied to the pyrrol group, are also added to these tables.

Acetanilid. Antifebrin .	$\text{C}_6\text{H}_5 \cdot \text{NH}(\text{C}_2\text{H}_5\text{O})$
Bromacetanilid. Bromated Antifebrin .	$\text{C}_6\text{H}_4\text{Br} \cdot \text{NH}(\text{C}_2\text{H}_5\text{O})$
Methyl-acetanilid. Ex-algin. Methylated Antifebrin . . .	$\text{C}_6\text{H}_5 \cdot \text{N}(\text{CH}_3)(\text{C}_2\text{H}_5\text{O})$
Acetoamidophenol. Hydroxy-antifebrin .	$\text{C}_6\text{H}_4(\text{OH}) \cdot \text{NH}(\text{C}_2\text{H}_5\text{O})$
Aceto-anisidin. Methacetin. Methoxy-antifebrin . . .	$\text{C}_6\text{H}_4(\text{O} \cdot \text{CH}_3) \cdot \text{NH}(\text{C}_2\text{H}_5\text{O})$
Aceto-phenetidin Phenacetin. Ethoxy-antifebrin . . .	$\text{C}_6\text{H}_4(\text{O} \cdot \text{C}_2\text{H}_5) \cdot \text{NH}(\text{C}_2\text{H}_5\text{O})$

The relationship of acetanilide to hypnone and hydracetin (pyrodine) is as follows:



Antithermin, though obtained by somewhat similar means to hydracetin has a very different constitution. It is prepared by the action of lævulinic acid on an acetic acid solution of phenylhydrazine, when the two unite with elimination of water to form the "hydrazone" known as antithermin, $CH_3 \cdot C(N \cdot NH \cdot C_6H_5) \cdot CH_2 \cdot CH_2 \cdot CO \cdot OH$.

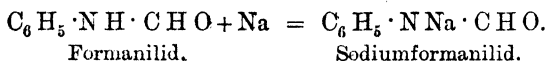
Benzosol. (*Pharm. Centr.*, 1890, 427; *Pharm. Journ.*, 3rd series, xxi. 81.) The use of guaiacol as a remedy for phthisis has caused increased attention to be paid to the preparation of this constituent of wood tar and of its compounds. The substance recently introduced under the name of "benzosol" may be represented as guaiacol—in which hydroxyl hydrogen is replaced by the benzoyl group— $C_6H_4(O \cdot CO C_6H_5)(O \cdot CH_3)$. It is said to be prepared by converting crude guaiacol, separated by fractional distillation from wood tar and boiling between 200° and 205° C., into a potassium compound, purifying this by recrystallization from alcohol, heating it upon a water-bath with a calculated quantity of benzoyl chloride, and recrystallizing the resulting benzoyl compound from alcohol. Or the same compound may be obtained by heating guaiacol with benzoic anhydride. Benzosol is described as forming small colourless crystals, melting at 50° C., almost odourless and tasteless when pure, almost insoluble in water, but freely soluble in chloroform and ether, as well as in hot alcohol.

As one of the advantages possessed by this compound it is stated that it is slowly saponified by the action of the gastric juice, so that the guaiacol is liberated under conditions that avoid the unpleasant taste of that compound and minimize its local irritation.

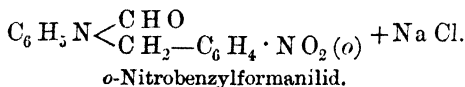
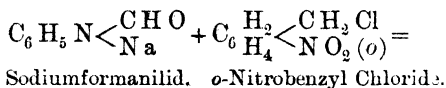
Orexin. A. Donner. (From *Pharm. Zeit.*, July 5, 1890; *Pharm. Journ.*, 3rd series, xxi. 43-45.) The body which under the name "orexin" has recently been added to the *Materia Medica* as a stomachic (see *Year Book of Pharmacy*, 1890, 215) is dealt with in this paper from a chemical point of view. It is the hydrochloride of a base designated "phenyldihydrochinazoline."

Orexin, according to the inventor, is prepared in the following manner. Formanilid—a compound which is produced by the action

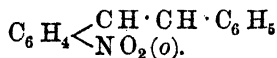
of formic acid upon aniline, just as acetanilid is formed by the action of acetic acid on aniline—is treated with metallic sodium, which results in the hydrogen atom still joined to the nitrogen being replaced by the metal, with the formation of sodium formanilid.



In the production of this latter compound the calculated quantity of sodium is added to a solution of formanilid in ten times its weight of pure benzene in a roomy retort fitted with a return condenser and heat is applied until it disappears. The new compound then separates as a voluminous white mass. Without separating it from the benzene a calculated quantity of *o*-nitrobenzyl chloride is allowed to react with it, when the sodium combines with the chlorine to form sodium chloride, and the organic residues unite to form *o*-nitrobenzylformanilid.



The reaction begins after slight warming, setting the benzol in violent ebullition, and is completed in half an hour. In order to separate the *o*-nitrobenzylformanilid from the other products of the reaction water is first added, which causes the formation of an aqueous layer, containing the sodium chloride, and a benzene layer in which the *o*-nitrobenzylformanilid is dissolved. The latter is separated and submitted to distillation in a current of steam to remove benzene and unattacked *o*-nitrobenzyl chloride. The residue solidifies, after the addition of a little alcohol-ether, to a crystalline paste, which is freed from an adherent smeary impurity by washing with ether. The product so obtained contains, besides *o*-nitrobenzylformanilid, a small quantity of another bye-product, *o*-nitrostilbene—



This is removed by fractional crystallization from alcohol, from which it is the first to separate.

Upon warming the alcoholic solution of *o*-nitrobenzylformanilid with granulated tin and hydrochloric acid the tin double salt of phenyldihydrochinazoline hydrochloride separates in white or faintly coloured flat needles or scales. By treatment with sulphuretted hydrogen the tin is removed from this compound as sulphide, and from the filtrate, after concentration, the hydrochloride of phenyldihydrochinazoline, or orexin, separates in the form of concentrically grouped needles.

Orexin crystallizes with two molecules of water of crystallization in white needles that melt at 80° C., and which when kept for some time in an exsiccator pass into the anhydrous form, melting at 221°.

A specimen of commercial orexin was submitted to examination by the author with results showing the characters of orexin to be as follows:

Orexin forms a white powder melting at 80° C., or colourless acicular crystals. It dissolves in 13 parts of water, as well as in alcohol; in ether it is insoluble.

In the aqueous solution (1 : 20) mercuric chloride produces a white, and potassium bichromate, a yellow precipitate, not altered by exposure to the air. Potassium permanganate solution is decolorized by it in the cold, and bromine solution with the formation of a yellowish amorphous precipitate.

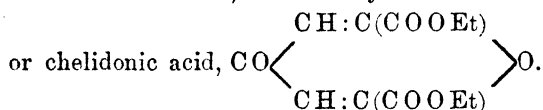
Upon heating a mixture of orexin with zinc dust a short time over a free flame a strong carbylamine odour is given off. After treating the mixture with hydrochloric acid, the filtrate, on the addition of chloride of lime solution, is coloured green.

Heated upon platinum the compound burns without leaving any residue.

Synthesis of Aconitic Acid. L. Claisen and E. Hori. (*Ber. der deutsch. chem. Ges.*, xxiv. 120-127.) The first step in the authors' synthesis consists in the formation of ethyl oxalacetate by the action of ethyl acetate and ethyl oxalate in the presence of sodium ethoxide. On treating the product with a strong solution of potassium acetate for some time, the potassium salt of a monobasic acid of the composition $C_{14}H_{18}O_9$ is obtained, which is the triethyl salt of aconitoxalic acid. The latter may then be liberated by hydrochloric or sulphuric acid. This acid produces an intense red coloration with ferric chloride. The conversion of this acid into aconitic acid is effected by dissolving it in alcohol, heating the solution on the water-bath for several hours, then concentrating by evaporation, and heating the aqueous solution of the

product until, on acidification with acetic acid it no longer turns red with ferric chloride. The resulting solution is acidified with acetic acid, mixed with calcium acetate, filtered, and the filtrate containing the calcium salt acidified with sulphuric acid, after which the aconitic salt is extracted with ether and purified by recrystallization. The product fuses at 191°C .

Synthesis of Chelidonic Acid. L. Claisen. (*Ber. der deutsch. chem. Ges.*, xxiv. 111–120. From *Journ. Chem. Soc.*) When an excess of ethyl oxalate reacts with acetone in the presence of sodium ethoxide, the sodium derivative of ethyl acetonoxalate, $\text{CH}_3\cdot\text{CO}\cdot\text{CH}_2\cdot\text{CO}\cdot\text{COOEt}$, is first formed, and this, by the further action of ethyl oxalate and sodium ethoxide, is converted into the disodium salt of ethyl acetonedioxalate, $\text{CO}\cdot(\text{CH}_2\cdot\text{CO}\cdot\text{COOEt})_2$. The latter is identical with ethyl xanthochelidonate, and is more stable than the acid, but is easily converted into ethyl chelidonate,



It is to be noted that on treating ethyl acetonoxalate with ethyl oxalate, the ethyl oxalate residue enters the methyl group, and not the group— $\text{CO}\cdot\text{CH}_2\cdot\text{CO}$ —. Probably other ethereal salts would give, with acetone, similar pyrone and xanthopyrone derivatives, and on treating these with ammonia, many new pyridine derivatives would be obtained. Ethyl acetonoxalate and ethyl acetonedioxalate correspond with the mono- and di-aldehyde derivatives of acetone. Compounds are easily prepared containing both an aldehyde and ethyl oxalate residue. Kerstiens has prepared such a compound by acting on acetone, first with an aldehyde, then with ethyl oxalate. By heating, they are converted into derivatives of dihydropyrone. If, however, acetone be treated first with ethyl oxalate and then with an aldehyde, both the ethyl oxalate and aldehyde residues enter the same methyl group of the acetone, and a lactone is formed. The author restricts his attention to ethyl acetonedioxalate and its reactions, and reserves the last-named compounds for a later communication.

Ethyl acetonedioxalate (ethyl xanthochelidonate) is prepared by dissolving ethyl sodacetonoxalate (5 grams) in hot ethyl oxalate (8 grams), and adding to the hot mixture a solution of sodium ethoxide (2 grams) in alcohol (10 c.c.).

The product is washed with hydrochloric acid and water, and purified by crystallization from alcohol. 350 grams of ethyl

sodacetonoxyalate yields about 320 grams of crude ethyl acetonedioxyalate; this crystallizes in slender prisms, melts at $103-104^{\circ}\text{C}$, is somewhat easily soluble in hot alcohol, methyl alcohol, and benzol, and gives an intensely yellow solution with dilute alkalis. By prolonged boiling, it is partially converted into ethyl chelidonate. The alcoholic solution gives with ferric chloride an intense brown colouration, with ferrous sulphate a dark green; a greenish yellow copper salt is precipitated by copper acetate, and a golden yellow lead salt by lead acetate.

Chelidonic acid is obtained by heating the above compound with fuming hydrochloric acid, in a sealed tube, for one hour at 100° , or more easily by simply evaporating it a few times with fuming hydrochloric acid on the water-bath. It forms colourless needles, and gives all the reactions of natural chelidonic acid, but melts at 262° with charring and evolution of gas. The natural acid obtained from the celandine melts at 220°C .

Ethyl chelidonate is obtained by saturating an alcoholic solution of ethyl xanthochelidonate with hydrogen chloride, and extracting the product with ether. It crystallizes from alcohol in short, lustrous prisms, melts at 63° , and is crystallographically identical with ethyl chelidonate prepared from the natural chelidonic acid.

Synthesis of Glycuronic Acid. E. Fischer and O. Piloty. (*Ber der deutsch. chem. Ges.*, xxiv. 521-528.) A solution of saccharic acid, obtained by decomposing the cadmium salt with sulphuretted hydrogen, is concentrated to a syrup, and heated for five to six hours on the water-bath to convert as much as possible into the lactone. 20 grams of this product is dissolved in 150 grams of water, well cooled, and mixed with 3 c.c. of sulphuric acid (20 per cent.), and 100 grams of sodium amalgam (2.5 per cent.). The mixture is constantly shaken, well cooled, and kept acid by frequent additions of dilute sulphuric acid. When the first lot of amalgam is used up, a second lot of 100 grams is added, and then 50 grams. The solution is neutralized with soda, evaporated on the water-bath until a large quantity of sodium sulphate separates, 10 grams of concentrated sulphuric acid mixed with double the weight of water is added, and the mixture poured into eight times the quantity of hot absolute alcohol. The hot, filtered alcoholic solution is evaporated to one-tenth its bulk, diluted with water, neutralized with barium hydrate, excess of baryta precipitated with carbonic anhydride, the baryta precipitated from the filtrate with sulphuric acid, and the liquid concentrated and neutralized while hot with white lead; the lead is precipitated with sulphuric

acid, and the filtrate evaporated to a syrup. The lactone of glycuronic acid separates after a time, is filtered, dried on porous plates, and a recrystallization from warm water is obtained in good, colourless crystals.

Compounds of Glycuronic Acid. E. Külz. (*Zeit. Biol.*, xxvii. 247-258.) This paper deals with the following compounds:—*phenylglycuronic acid*, *quinolglycuronic acid*, *resorcinolglycuronic acid*, *thymolglycuronic acid*, and *turpentineglycuronic acid*. For particulars, reference should be made to the original.

Derivatives of Angelic and Tiglic Acids. P. Melikoff and P. Petrenko-Krittchenko. (*Liebig's Annalen*, cclviii. 116-132.) The authors have studied the behaviour of the potassium and silver salts of α -chloro- α -methylhydroxybutyric acid obtained from tiglic acid, and α -chlorhydroxyvaleric acid obtained by treating angelic acid with hypochlorous acid. Their results afford definite proof of the non-identity of the two acids.

Daturic Acid. E. Gérard. (*Comptes rendus*, cxi. 305.) The seeds of *Datura stramonium* yield to ether a fatty acid of the formula $C_{17}H_{34}O_2$, occupying an intermediate position between palmitic and stearic acids. He proposes for it the name "daturic acid."

Cerotic Acid. T. Marie. (*Journ. de Pharm. et de Chim.* [5], xxii. 343-344.) 125 grams of bees'-wax is heated with 3 litres of 93% alcohol for two hours. After cooling, the alcoholic jelly is poured off and the treatment with alcohol is repeated two or three times, and each time for a longer period, until the whole of the cerotic acid is removed. The alcoholic portions are united, filtered, and distilled with a little potash, to retain the volatile acids which have been removed from the wax, and the distillate serves to dissolve the impure acid upon the filter. This solution being heated to boiling, the myricin contained forms minute droplets, which are deposited on cooling quietly, and adhere closely to the flask. The supernatant jelly is poured on to a filter and washed with a small quantity of alcohol. After three such treatments and two crystallizations from alcohol, the acid is colourless, and melts at $76-77^\circ$; it is then almost pure. If converted into the lead salt, according to Brodie's method, ether extracts but an insignificant amount of matter, and the regenerated acid melts at 78° .

Preparation of Cinnamic Acid and its Homologues. L. Claisen. (*Ber. der deutsch. chem. Ges.*, xxiii. 976-978.) Ethyl cinnamate is obtained by slowly adding benzaldehyde (1 mol.) to sodium wire (1 at.), contained in excess of ethyl acetate. The mixture is

allowed to stand a short time, and is then treated with water and acetic acid. After separating the aqueous solution and distilling off the unaltered ethyl acetate, an oily liquid is left which boils at 260-270°, and from which cinnamic acid is obtained by hydrolysis. The yield of ethyl cinnamate is 100-110 per cent. of the weight of the benzaldehyde employed. The same result is brought about by the action of sodium ethoxide in alcoholic or anhydrous ethereal solutions; the cinnamic acid obtained is however impure, and the yield is small. Ethyl benzalbutyrate is obtained in a similar manner from benzaldehyde and ethyl butyrate. This reaction may be explained by supposing that benzaldehyde, ethyl acetate, and sodium unite to form the sodium compound of ethyl phenylhydroxypropionate, and that the free ethereal salt obtained after acidifying is decomposed on distillation into ethyl cinnamate and water.

Synthesis of Citric Acid. A. Haller and A. Held. (*Comptes rendus*, cxi. 682-685. From *Journ. Chem. Soc.*) Ethyl acetodicarboxylate is prepared from ethyl γ -cyanacetoacetate in the manner previously described, and the ethereal solution of the crude product from 10 grams of the cyanacetoacetate is converted into a cyanhydrin by cooling it in a mixture of ice and salt, adding 5 to 6 grams of finely powdered potassium cyanide, and then, drop by drop, concentrated hydrochloric acid in quantity exactly equivalent to the cyanide. The mixture is allowed to remain in a closed vessel in a cool place for 24 hours, and is then filtered, and the ether distilled off. The cyanhydrin is boiled for two or three hours with concentrated hydrochloric acid in an apparatus with a reflux condenser, the ammonium chloride is removed, and the liquid, after being concentrated to expel excess of acid, is boiled with excess of potash. The liquid now contains potassium citrate and chloride with other products formed in the course of the reactions. The citric acid is best separated by means of lead acetate, the precipitate being decomposed by hydrogen sulphide, and the citric acid extracted by means of ether.

50 grams of ethyl γ -cyanacetoacetate yield about 6.2 grams of pure citric acid, and a further quantity of 4 to 5 grams remains in the syrupy mother liquor.

Phenylitaconic Acid. R. Fittig and P. Röders. (*Liebig's Annalen*, cclvi. 87-96.) Benzylsuccinic acid, $C_{11}H_{12}O_4$, is obtained when phenylitaconic acid is reduced with sodium amalgam, the solution being kept only slightly alkaline by the frequent addition of dilute sulphuric acid. It crystallizes from hot water in plates, melts at 161°, and is readily soluble in hot water and alcohol,

but only sparingly in benzene, chloroform, and cold water. This acid has been previously prepared by Perkin from benzylacetylenetetracarboxylic acid. The *silver* salt, $C_{11}H_{10}O_4Ag_2$, is very sparingly soluble in hot water, and darkens on exposure to the light or when boiled with water. The *calcium* salt, $C_{11}H_{10}O_4Ca$, is very sparingly soluble both in hot and cold water. The *barium* salt, with $\frac{1}{2}H_2O$, separates as a powder when a cold concentrated aqueous solution is heated. The *anhydride*, $C_{11}H_8O_3$, prepared by distilling the acid, crystallizes from light petroleum in needles, melts at 102° , and is readily soluble in chloroform, benzene, and ether, but only sparingly in light petroleum and carbon bisulphide.

Indene and Cinnamene in Coal-Tar. G. Kraemer and A. Spilker. (*Ber. der deutsch. chem. Ges.*, xxiii. 3276-3283.) From the higher fractions of the light oils obtained from coal-tar the authors have isolated a colourless hydrocarbon of the composition C_9H_8 , which they propose to name *indene*. Its composition is represented by the formula $C_6H_4 \begin{smallmatrix} CH \\ < \\ CH_2 \end{smallmatrix} > CH$. The red coloration, which is produced on dissolving impure naphthalene in sulphuric acid is due to the presence of indene.

Cinnamene can be isolated from coal-tar in the form of the crystalline dibromide, $C_8H_8Br_2$, by treating well-cooled, crude xylene with bromide and evaporating the solution.

Cause of the Red Coloration of Carbolic Acid. E. Fabini. (*Pharm. Post*, 1891, 2, 25, 41 and 61, and 105.) According to the author this colouration is due to the action of hydrogen peroxide upon carbolic acid in the presence of traces of ammonia and of a metal (copper, iron or lead). One part of copper or iron in 300,000 parts, or 1 of lead in 65,000 parts, and 1 of ammonia in 10,000 is sufficient to produce a visible reaction. The appearance of the colour is explained by the formation of ammonium phenylate (by absorption of ammonia from the air), which, with the metallic salt present in the carbolic acid, forms a metal-phenylate, which in turn is acted upon by hydrogen peroxide, producing the colouring principle and liberating the metal. Copper sulphate with ammonium phenylate gives a green precipitate of cupric phenylate; the latter, upon the addition of hydrogen peroxide, produces at once the red colouring matter. This is soluble in alcohol, and is reprecipitated upon addition of water; upon drying it forms a black, brittle substance which possesses the property of colouring carbolic acid. One part in 300,000 will still impart a

faint red colour. The colouring matter is *entirely* organic, being absolutely free from metal; it is volatile, and is coloured blue by concentrated sulphuric acid. The presence of a metal is absolutely essential to its production. The author proposes the name *phenerythene* for this colouring matter.

Combination of Camphor with Phenols. E. Léger. (*Comptes rendus*, cxi. 109-111.) The author describes a number of compounds obtained by melting together camphor and phenols in suitable proportions in closed vessels. In this manner he obtained *phenol monocamphoride*, *phenol hemicamphoride*, *resorcinol monocamphoride*, *resorcinol dicamphoride*, *α -naphthol camphoride*, *β -naphthol camphoride*, *salicylic camphoride*, and *salol camphoride*. These bodies decompose easily under the influence of heat, or when treated with solvents or with alkalies. They are nevertheless definite compounds, as is proved by the observation that in each case fractional crystallization yields products of equal composition.

Chloral-Phenol. E. Fabini. (*Amer. Journ. Pharm.*, June, 1891.) Chloral-phenol or chloral-carbolic acid is made by triturating equal weights of chloral hydrate and pure carbolic acid; it forms a colourless, viscid liquid, specific gravity at 20° C. = 1.289; it possesses prominently the odour of chloral hydrate, has a sweet, caustic taste, and placed upon the skin produces irritation and blisters. It is readily miscible with alcohol, acetic acid, amylic alcohol, chloroform, carbon disulphide and ether; in the latter case considerable heat is developed; it is insoluble in petroleum ether. Its alcoholic solution when treated with strong sulphuric acid colours the latter beautifully red. Chloral-phenol, in small quantity, coagulates albumen; an excess again dissolves it.

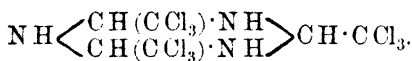
Chloralimide and its Isomeride. MM. Béhal and Choay. (*Comptes rendus*, cx. 1270-1273. From *Journ. Chem. Soc.*) 500 grams of chloral ammonia is mixed with 200 grams of anhydrous chloral and distilled on a water-bath until 100 grams of chloroform have been collected. From this point distillation is continued in a vacuum until nothing more passes over. The residue is exhausted with cold alcohol of 95°; chloralimide remains undissolved and isochloralimide passes into solution. Isochloralimide is precipitated by the addition of dilute alcohol and purified by repeated crystallization from boiling alcohol of 90°. It is insoluble in water, melts at 103-104°, is decomposed by mineral acids with liberation of chloral and formation of the corresponding ammonium salt, and is even decomposed by platinic chloride with formation

of ammonium platinochloride. When heated with alkalis, it evolves an odour of carbylamines, ammonia is liberated, and a formate and chloroform are produced.

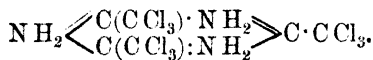
Isochloralimide and chloralimide have the same composition, and determinations of the molecular weight by Raoult's method, in solution in benzene, gave a number corresponding in both cases to the molecular weight, which agrees with the triple formulæ previously adopted.

If isochloralimide is heated with methyl chloride in a sealed tube at 100° , it is converted into chloralimide, and if the latter is dissolved in chloroform and mixed with 3 mols. of bromine, it is converted into isochloralimide. Acid chlorides give the same compounds with both isomerides, yielding very stable products.

The authors ascribe to the isomerides the following constitution :



Chloralimide.



Isochloralimide.

The presence of the amido-group in isochloralimide is indicated by its greater solubility, and by the production of chloroform and a carbylamine when treated with an alkali.

Camphor. F. Foerster. (*Ber. der deutsch. chem. Ges.*, xxiii. 2989.) The author finds that sublimed camphor contains a small quantity of impurity, and that for the determination of its rotatory power high temperatures must be avoided in its preparation, and the camphor finally twice recrystallized from 50 per cent. alcohol. It then melted at 174.8 – 175.3° , and after six crystallizations at 176.3 – 176.5° , and after ten crystallizations the solidifying point was found by Landolt's method to be 178.7° . The boiling point of the purified camphor was 209.1° under 759 mm.

Estimation of Camphor. F. Foerster. (*Ber. der deutsch. chem. Ges.*, xxiii. 2981.) A number of substances now occur in commerce, consisting of nitro-cellulose and camphor, and up to the present no method is known for estimating the amount of camphor which they contain. The author proposes to carry out the estimation by distilling the substances with soda solution, when the camphor readily passes over. This may be then extracted with benzol, and the specific rotatory power of the benzol

solution ascertained. Detailed instructions for carrying out the reaction, and tables of the rotation of camphor in benzol solution at different concentrations and temperatures are given in the original. The results obtained are about 0.7–1.0 per cent. too low, probably owing to the difficulty of driving out the last portions of camphor.

The Constitution of Cymene. O. Widman. (*Ber. der deutsch. chem. Ges.*, xxiv. 439–456.) The author's experiments lead to the conclusion that cymene contains the isopropyl and not the normal propyl group, as hitherto supposed. The frequent change of one group into the other, assumed in these compounds, does not therefore take place, as all are in reality isopropyl compounds. The supposition that thymol and carvacrol are propyl derivatives only rests on their relationship to cymene, and therefore these, and in all probability all naturally occurring terpenes and camphors, are also isopropyl derivatives.

Potassium Myronate. P. Birkenwald. (*Pharm. Zeitschr. für Russland*, xxix. 785–787.) The author has prepared potassium myronate from the seeds of *Brassica nigra* and *Sinapis juncea*, by Will and Körner's method; both the specimens melted at 135°, and decomposed at 145°. The loss on heating at 100° during four hours amounted to 2.43 per cent. in the case of the specimen from *Brassica nigra*, and to 3.32 per cent. in that of the specimen from *Sinapis juncea*. The loss on heating should have been 4.3 per cent. to correspond with 1 mol. H₂O. The analysis of the specimen from *Sinapis juncea* gave results corresponding with those which Will obtained with a specimen from *Brassica nigra*.

Terpenes and Essential Oils. O. Wallach. (*Liebig's Annalen*, cxlviii. 319 and 340.) The author's further experiments show that cineolic acid has the composition C₁₀H₁₆O₅ previously assigned to it.

A sample of "massoy-bark oil" obtained from the same source as the oil investigated by Woy proves that Woy's "massoyene" is not a new terpene but a mixture of various compounds, from which the author isolated pinene.

Oil of Turpentine. R. G. Dunwoody. (*Chem. Centr.*, 1890, ii. 241, 242.) The author finds very considerable variations in the specific rotatory power and the specific gravity of oil of turpentine. In twelve samples, the former varied from 2.60° to 36.64° in a 200 min. tube, before rectification, and from 3.90° to 38.62° after rectification. The specific gravity at 15° varied from 0.856 to 0.876 before, and from 0.851 to 0.873 after rectification. The oils com-

menced to boil at 155–159°, and the last portions distilled between 165° and 170°; the principal part distilled at 160–162°. The author has not found Allen's test with castor-oil, for the detection of petroleum in turpentine, of much value, since an admixture of 65 per cent. of the former escaped detection by means of this test. In pure glacial acetic acid both petroleum and turpentine are perfectly miscible, but of acetic acid containing 1 per cent. of water, the quantity required for complete solution is the greater the larger the proportion of petroleum which is present, as is shown in the following table:—

Petroleum	1	2	3	4	5	7	8 c.c.
Oil of Turpentine .	9	8	7	6	5	3	2 „
Acetic Acid + 1 per cent. H ₂ O	40	60	80	110	150	230	270 „

From the pitch remaining in the retort, after the distillation of the turpentine, the author has separated, with light petroleum, two well crystallized substances, the one being abietic acid, melting at 131°, and the other, a new substance, containing 72–72·8 per cent. of carbon, 9·50–9·75 per cent. of hydrogen, 17·70–18·25 per cent. of oxygen, and melting at 125–126°.

The Composition of Beeswax. A. Buisine and P. Buisine. (*Bull. Soc. Chim.* [3], iii. 867–873; *Journ. Chem. Soc.*, 1891, 131.) The authors confirm the results previously obtained by Hübl and Hebner with respect to the free, total, and combined acids of beeswax; further, they have determined the iodine numbers for this substance, and describe a process for estimating the alcohols present. This consists in the fusion of the wax with potassium hydrate and potash lime at 250°, which causes the evolution of hydrogen proportionally to the amount of alcohols acted on, and from the residue of this experiment the hydrocarbons existing in the wax are determined by extraction with a suitable solvent. Their results for pure, dry, washed bees'-wax are summarised as follows:

M. p. 63–64. Entirely soluble in hot chloroform.

Wax Acids.

Free acids corresponding with 19–21 milligrams K H O per gram.	
„	13·5–15·5 per cent. cerotic acid.
Total acids	91–97 milligrams K H O per gram.
Combined acids	72–76 „ „
„	32·85–34·67 per cent. palmitic acid.
Ratio of free to combined acid	3·5 to 3·8.

Iodine Numbers.

100 parts of wax absorb 8·3–11 parts iodine; which corresponds to 9–12 per cent. oleic acid.

Wax Alcohols.

Hydrogen liberated by fusion with KHO , 53·5–57·5 c.c. per gram.

Wax Hydrocarbons.

M. p. 49·5. Percentage 12·5–14. Iodine fixed by 100 parts of hydrocarbon 22·05.

Aldepalmitic Acid. A new Constituent of Butter Fat. J. A. Wanklyn. (*Pharm. Journ.*, 3rd series, xxi. 759.) The author describes a new fatty acid which he considers to be the hitherto unrecognised principal constituent of butter fat. *Aldepalmitic acid* is represented by the formula $(\text{C}_{16}\text{H}_{30}\text{O}_2)_n$, the n of the formula representing at least 2. It is said to differ from palmitic acid also in specific gravity and melting point, but especially in its behaviour towards 85 per cent. alcohol. At ordinary temperature the solubility of the two acids in alcohol of this strength is stated to be nearly the same, but whilst the solubility of palmitic acid increases slowly as the temperature rises that of aldepalmitic acid rises very abruptly, so that at 25° C. it is soluble in its own weight of alcohol. As the alcoholic solution of aldepalmitic acid cools the liquid gelatinises and the author states that the new acid is in this way capable of solidifying five times its weight of alcohol.

Amount of Volatile Fatty Acids in Rancid Butter. P. Corbetta. (*Chem. Zeit.*, xiv. 406.) The author finds that the disappearance of volatile fatty acids in the rancid butter, although progressive, is in no instance very considerable, and in no case could volatile fatty acids be washed from the rancid butter either by water or sodium hydrogen carbonate.

Cause of the Rancidity of Fats. E. Ritsert. (*Pharm. Zeit.*, Sept. 13, 579–586. From *Pharm. Journ.*) The author found that notwithstanding the occurrence of most diverse micro-organisms in rancid fat, both aerobic and anaerobic germs die when added to fresh undecomposed fat, from which it was inferred that the change is not initiated by them. It was also found that under the influence of sunlight, which killed the germs, the rancidity was produced more rapidly. Experiments were therefore made

with sterilized lard : (1) protected from access of air, but exposed to sunlight, diffused light, and kept in the dark ; (2) with access of air, exposed to sunlight, and kept in the dark ; (3) in atmospheres of moist and dry oxygen, carbonic acid, nitrogen and hydrogen. As a general result it may be stated that the condition favourable to the production of rancidity proved to be the action of light during contact with air, the change being induced more rapidly the more intense the light. Thus it was found that sterilized lard, either moist or dry, when kept from contact with air in sealed tubes, remained free from rancidity after two months, even though exposed to sunlight and warmth. When Erlenmeyer's flasks were filled with sterilized lard, stopped with sterilized wadding, and exposed to sunlight, rancidity was evident at the end of a week ; but if the contents of the flask were sheltered from light by a coating of black varnish, the lard remained sweet after two months, even when the flasks were only partly filled. In order to ascertain to which constituent of the atmosphere the change is due, the quantity of oxygen, nitrogen, hydrogen, and carbonic acid absorbed by sterilized lard under similar conditions was noted and the effect produced upon the fat. Oxygen, both dry and moist, was absorbed freely in the light, the fat becoming strongly rancid in one month ; but none was absorbed in the dark, the fat remaining quite fresh. Nitrogen and hydrogen both remained unabsorbed, whether exposed to the light or kept in the dark, and the lard did not become rancid. Carbonic acid, dry and moist, was absorbed in the light and to a less extent in the dark, but the lard only acquired a tallow-like taste and no odour.

A New Method for the Saponification of Fats, Waxes, etc. A. Kossel and K. Obermüller. (*Amer. Journ. Pharm.*, October, 1890.) The fat, etc., is dissolved in ether and an alcoholic solution of sodium ethylate added ; after a short time a compact precipitate forms which consists of the sodium soaps, the nature of which allow rapid filtration and washing. For 100 to 150 grams of fat the sodium ethylate formed by dissolving 10 grams of metallic sodium in 150 to 200 c.c. of absolute alcohol is required, but to insure complete saponification, it is preferable to use two to three times this proportion of sodium dissolved in the above quantity of alcohol ; it is also advisable to allow twenty-four hours' time for the saponification. The otherwise very difficultly saponifiable wool-fat is very easily saponified under these conditions. Instead of preparing the sodium ethylate, metallic sodium can be added to the alcohol-ether solution of the fat ; the sodium becomes coated

with a layer of soap, which, upon agitation, easily separates. This method is especially adapted to the study of those fat constituents which, after saponification, are soluble in ether, the small quantity of soap dissolving in the ether being removed by agitation with several portions of water.

The Chemical Formula of Cholesterin. K. Obermüller. (*Zeit. physiol. Chem.*, xv. 37-48.) Two formulæ, $C_{26}H_{44}O$ and $C_{27}H_{46}O$, have been ascribed to cholesterol (cholesterin). The chief object of the present research was, by the analysis of certain cholesterol compounds, to determine which is the correct one. The general result of the analyses is that Reinitzer's formula is correct.

Reaction of Cholesterin. K. Obermüller. (*Chem. Centr.*, 1890, 299-300.) 10 grams of cholesterin are melted with 5 grams of propionic anhydride. The *propionate*, $C_2H_5 \cdot COOC_{27}H_{45}$, crystallizes in rhombic plates resembling cholesterin, and as the substance cools it gradually assumes a violet, blue, green, dark green, orange, carmine, and finally copper-red coloration. The deep blue and the green especially remain a considerable time. If suddenly cooled, the substance assumes the copper-red colour, which also remains a considerable time. If the substance be melted in a flask in warm glycerine solution at 98° , it assumes a blue colour. The colours are seen by reflected light; if viewed by transmitted light, the complementary colours are observed. Examined under the polarizing microscope with transmitted light, the melted substance becomes first blue-green, then greyish blue, followed by light blue, a constant motion being observed; then suddenly it remains stationary, and groups of crystals of spheroid form appear, which exhibit the black cross indicative of doubly refracting crystals. The mass becomes again set in motion, and while the crosses vanish, it assumes a yellow-red colour, then a violet, blue, light green, and finally dark green colour is observed; the last suddenly disappears, and again aggregates of doubly refractive crystals make their appearance which are much larger than the first.

In applying this reaction for the detection of cholesterin, the latter is separated as far as possible from other substances; a small quantity is then melted carefully with two or three drops of propionic anhydride. By suddenly cooling, a lustrous fatty mass is obtained, and if a small portion of this is melted on a glass rod and held against a dark background, the colour reactions are readily observed.

Action of Nitric Acid on the Ligno-Celluloses. C. F. Cross and E. J. Bevan. (*Proc. Chem. Soc.*, No. 96.) Dilute nitric acid attacks the ligno-celluloses when heated with them at 60°. The products are in the first instance a bright yellow derivative of the fibre substance (lignone) and nitrous acid. By the further interaction of these, a characteristic decomposition is determined, large quantities of nitrous oxide (F_2O) being evolved together with carbonic anhydride, only a small proportion of nitric oxide being formed. A sensible quantity of hydrogen cyanide is also produced, the proportion being increased by increase of temperature.

These observations point to the entrance of the NOH residue into the lignone molecule and its interaction with nitrous acid according to the equation $\overset{\text{C}}{\underset{|}{\text{C}}}:\text{NOH} + \text{NOH} \cdot \text{O} = \text{N}_2\text{O} + \text{H}_2\text{O} + \overset{\text{C}}{\underset{|}{\text{C}}}\text{O}$, the final result being the displacement of 2H by O. The action is probably general for compounds containing the NOH residue—hydroximes and nitrolic acids—and the authors suggest that attention should be paid to the gaseous products formed by the interaction of nitric acid and carbon compounds as calculated to elucidate their mechanism.

The investigation, of which this is a preliminary note, is proceeding.

An Acid Solvent of Cellulose. C. F. Cross and E. J. Bevan. (*Chemical News*, February 6th, 1891.) A solution of zinc chloride in twice its weight of acetic anhydride is found by the authors to possess the power of readily dissolving cellulose without effecting any decomposition of the latter.

Colloid Carbohydrates. J. Pöhl. (*Zeitschr. für physiol. Chem.*, xiv. 151. From *Pharm Journ.*) Like the albumenoids the colloid carbohydrates can be precipitated from their solutions in certain degrees of concentration by neutral salts. The precipitates are not chemical compounds, but mechanical mixtures; and according to the author may serve for the isolation and purification of the different components of mixtures of carbohydrates. He divides the colloids into four groups, in respect to their behaviour: (a) not precipitated by neutral salts: gum arabic, sodium arabinat; (b) precipitated upon saturation with ammonium sulphate: the mucilages of tragacanth, althæa, linseed and quince; (c) precipitated upon saturation with ammonium sulphate, ammonium phosphate and potassium acetate: mucilage of carrageen; (d) precipitated upon saturation with sulphates of sodium, magnesium and ammonium and ammonium phosphate: soluble starch, lichen

starch, dextrin and salep mucilage. By fractional precipitation the author has obtained two carbohydrates from salep mucilage, and shown that the cydonia mucilage is not an ethereal body, but a mixture of a body resembling cellulose with a carbohydrate resembling that of tragacanth, and yielding arabinose upon hydrolysis.

Carbohydrates in Peach Gum. W. E. Stone. (*Amer. Chem. Journ.*, xii. 435-440.) The author finds that peach gum contains both arabinose and galactose, that is, a true glucose associated with a pentaglucose.

Levosin, a New Carbohydrate from Cereals. C. Tanret. (*Comptes rendus*, cxii. 293-295; *Journ. Chem. Soc.*, 1891, 661.) Ground rye is extracted with alcohol of 50°, and the solution is mixed with twice its volume of alcohol of 94°, which precipitates a quantity of gum. The alcohol is partially distilled off, and the residue mixed with baryta-water until the addition of more merely produces a precipitate which redissolves immediately. It is then filtered, and mixed with a large quantity of hot, concentrated baryta solution, until a permanent precipitate is obtained; this precipitate is washed with baryta-water, decomposed by carbonic anhydride, and the solution concentrated, when levosin separates. To remove the small quantity of barium which it contains, it is dissolved in the smallest possible quantity of alcohol of 60°, mixed with just sufficient dilute sulphuric acid, and after removal of the barium sulphate, is precipitated with excess of alcohol of 95°.

Levosin, dried at 110°, has the composition $nC_6H_{10}O_5$, and determinations of the molecular weight by Raoult's method show that the value of n is 4. When the anhydrous compound is exposed to air, it increases in weight by 11 per cent., and forms a hydrate $C_{24}H_{40}O_{20} + 4H_2O$. Levosin is a white, almost tasteless compound, which dissolves in water in all proportions, and is very soluble in dilute alcohol, but is almost insoluble in alcohol of 95°. It softens at 145°, and melts at 160°; sp. gr. = 1.62; rotatory power $[\alpha]_D = -36^\circ$, which is not affected by the age of the solution or by temperature. It does not reduce Fehling's solution, is not affected by diastase, and does not ferment with beer-yeast. In presence of very dilute acid, it becomes hydrated with the same rapidity as cane-sugar, and the change is complete if the levosin is heated with water alone in sealed tubes at 100° for 24 hours. The rotatory power of the product is $[\alpha]_D = -76^\circ$, and it consists of a mixture of 75 per cent. of levulose and 25 per cent. of a dextrose with a very feeble dextrorotatory power.

Levosin exists in rye to the extent of 0·8 per cent. of the dried grain; in green wheat it is present in the same proportion, but in ripe wheat only to the extent of 0·2 per cent. In the case of barley the variations are greater, the proportion in the green grains in July being 2·0 per cent. of the dried matter, whilst in the ripe grains there was only 0·1 per cent. Oats, whether green or ripe, and ripe maize, contain no levosin.

Conversion Products of Starch. A. Marcacci. (*Bied. Centr.*, xix. 792. From *Journ. Chem. Soc.*) Potato starch, even in quite ripe potatoes, becomes converted into cane-sugar; and barley and wheat grains, in germinating, double the amount of cane-sugar at the expense of the starch they originally contained. Samples of potato meal and finely-cut potatoes were dried, some in the sun, and some in a drying oven at 45°; an increase of cane-sugar was observed in the artificially dried potato; in the cut potatoes the amount of sugar was more than doubled when dried at 45°. In germination, potatoes gain saccharose; the starch is probably converted, first into saccharose and then into glucose. The formation of dextrin is not necessary.

Starch is formed by the elimination of water. Unripe wheat grains contain much glucose and saccharose; when the same amount of grains were examined after being dried in the sun, the sugar had disappeared, and was found to be replaced by starch.

The Chemical Nature of Diastase. H. P. Wijsman. (*Rec. Trav. Chim.*, ix. 1-13. From *Journ. Chem. Soc.*) The author starts with the assumption that the diastase of malt is composed of a mixture of two enzymes—*maltase* and *dextrinase*. The former converts starch into a mixture of maltose and a dextrin coloured violet by iodine, and corresponding with the erythrogranulose of various workers; the latter enzyme converts starch into a dextrin which reduces Fehling's solution, is not coloured by iodine, and corresponds with the maltodextrin of Herzfeld and of Brown and Morris. Maltodextrin is converted into maltose by maltase, and when dextrinase acts on erythro-granulose, a dextrin is formed which does not reduce Fehling's solution, and is not coloured by iodine—this dextrin the author terms *leucodextrin*.

The following experiments are quoted in proof of the above theory. A diastase was prepared by fractionally precipitating with alcohol of 97 per cent., a malt-extract, made with 20 per cent. alcohol, and purifying the precipitate by repeated solution and precipitation. The method employed to show the presence of two enzymes in this preparation consisted of partial separation by

diffusion into a gelatinous mass, made by adding gelatin to a solution of Lintner's soluble-starch. When a small quantity of diastase solution was placed on a layer of the solidified starch solution, the progress of the hydrolysing action of the former could be traced by means of iodine solution, it being found that after 1-2 days' action the diffusion-field of the diastase formed a colourless zone bordered by a violet ring, whilst the gelatin with unaltered starch was coloured deep blue. From this the author assumes that the two enzymes diffuse into the gelatin mixture at different rates depending on their relative concentrations, and the violet-coloured ring denotes the space in which the maltase has penetrated beyond the dextrinase, whilst in the non-coloured inner zone both enzymes are present. When a portion of the violet-coloured ring was removed, and placed on a fresh portion of starch-gelatin, and the enzyme allowed to diffuse, no non-coloured zone was observed, the whole of the product of the action being coloured violet by iodine. The author also mentions, as a proof of his theory, the known fact that alcohol, heat, acids, etc., have a differential action on diastase: maltase and dextrinase being influenced to a greater or lesser extent by these reagents.

The formation of maltose was proved by means of *Photobacterium phosphorescens*, which develops phosphorescence by the oxidation and assimilation of certain foods, of which maltose is one. Starch and the dextrins are not able to bring about the phosphorescence. By means of the starch-gelatin method, used in conjunction with this bacterium, the author considers that he proves the formation of maltodextrin by the action of dextrinase, and the subsequent conversion of this into maltose by the action of maltase.

Starch and Dextrin. C. Scheibler and H. Mittelmeier. (*Ber. der deutsch. Chem. Ges.*, xxiii. 3060-3075.) The authors give a historical review of the investigation of starch and of the compounds derived from it by hydrolysis, followed by a sketch of the recent work and present theories on the subject. The experimental part of the present communication is limited to an investigation of dextrin. They do not regard the latter as a definite compound but believe that it belongs wholly, or in great part, to the class of sugars containing an aldehydic or ketonic group. The presence of an aldehydic group in dextrin is indicated by the results of experiments given in this paper, and further by the fact that the products of hydrolysis are also aldehydes.

By the hydrolysis of starch, the authors have only obtained

glucose, but from commercial "starch sugar" they have isolated an unfermentable compound which resembles dextrin, and, from the analysis of its osazone, has the formula $C_{12}H_{22}O_{11}$, being thus isomeric with maltose.

Syntheses in the Sugar Group. E. Fischer. (*Ber. der deutsch. chem. Ges.*, xxiii. 2114-2141.) The present paper is a very interesting survey of the results obtained by the author and others in their investigations of the sugar group. We reproduce the following from a copious abstract in *Journ. Chem. Soc.*, November, 1890.

A few years ago (1886), dextrose, levulose, galactose, and sorbinose were the simplest known members of the sugar group, arabinose, which was at one time thought to be an isomeric of grape-sugar, having been shown by Kiliani to have the molecular formula $C_5H_{10}O_5$.

The constitution of dextrose and galactose is, at the present time, expressed by the formula $CH_2(OH) \cdot [CH(OH)]_4 \cdot COH$, and that of levulose by the formula $CH_2(OH) \cdot [CH(OH)]_3 \cdot CO \cdot CH_2 \cdot OH$, these formulæ being based on the following facts:—On reduction with sodium amalgam, dextrose and levulose yield mannitol, and galactose yields dulcitol, both of which compounds were proved to be hexahydric derivatives of normal hexane. On oxidation with chlorine- or bromine-water, dextrose and galactose are converted into monocarboxylic acids, gluconic acid and galactonic acid, and on further oxidation into dicarboxylic acids, saccharic acid, and mucic acid; they contain, therefore, the aldehyde group. Levulose, on the other hand, is only very slowly acted on by cold bromine-water, and is destroyed by more powerful oxidising agents. All three sugars combine with hydrogen cyanide; on hydrolysis, the cyanhydrin obtained from dextrose and galactose yields normal heptylic acid, whilst that obtained from levulose gives methyl-butylactic acid. Both dextrose and galactose combine with phenylhydrazine and with hydroxylamine just like simple aldehydes.

The one argument which is still brought against the aldehyde formula, namely, that dextrose and galactose do not give the characteristic reaction of aldehydes with a sulphurous acid solution of rosaniline, cannot be regarded as of much importance, because no simple fatty hydroxyaldehyde has yet been tested with this reagent.

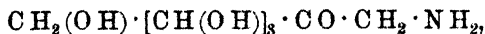
The great want of a suitable method for the isolation of sugars was supplied by the discovery of the phenylhydrazine reaction. When a warm 10 per cent. aqueous solution of dextrose is warmed

for 10-15 minutes with a solution of phenylhydrazine in dilute acetic acid, glucosazone, $C_{18}H_{22}N_4O_4$, is deposited in crystals. The formation of this substance takes place in two phases; the sugar first combines with the base (1 mol.) like an ordinary aldehyde, forming a readily soluble hydrazone, but in presence of excess of phenylhydrazine the hydrazone undergoes a peculiar oxidation, one $CH_2 \cdot OH$ -group being converted into the carbonyl-group, which then reacts with the base (1 mol.) in the usual way.

The fact that the osazone obtained from dextrose is identical with that formed from levulose proves, not only that this explanation of the reaction is correct, but also that both compounds have the constitution $CH_2(OH) \cdot [CH(OH)]_3 \cdot C(N_2HPh) \cdot CH:N_2HPh$.

All natural sugars which reduce Fehling's solution, including lactose and maltose, behave in this way with phenylhydrazine, as do also all aldehydes and ketones which contain a $CH_2 \cdot OH$ - or $CH \cdot OH$ -group adjacent to the aldehyde or carbonyl-radicle. The hydrazones of most of the naturally occurring sugars are readily soluble in water, but mannose and its optical isomerides, and the various artificial sugars containing 7, 8, and 9 carbon-atoms form hydrazones, which are only sparingly soluble, and which can therefore be most conveniently employed for the identification or isolation of these sugars, into which they can be re-converted by decomposition with hydrochloric acid. When a hydrazone is vigorously shaken with hydrochloric acid of sp. gr. 1.19 at the ordinary temperature, a brown solution of the hydrochloride is obtained, but after one to two minutes the separation of phenylhydrazine hydrochloride commences, and in 10 to 15 minutes decomposition is complete; the sugar can be easily isolated from the filtered solution.

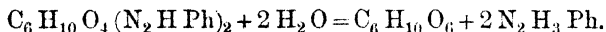
Of far more value for the identification of sugars are the almost insoluble, crystalline osazones, which differ from one another in solubility, melting point, and optical behaviour. On reduction with zinc dust and glacial acetic acid, they are converted into basic compounds. Glucosazone, for example, yields the compound—



one hydrazine-group being displaced by oxygen, the other being converted into an amido-group, with elimination of aniline; when this base is treated with nitrous acid in the cold, it is converted into levulose. As the other bases obtained in like manner do not

crystallize well, the reconversion of the osazones into the sugars is best effected by decomposing them with fuming hydrochloric acid. When finely divided glucosazone is quickly heated to 40° with fuming hydrochloric acid, the solution kept at this temperature for one minute, and then cooled to 25° , phenylhydrazine hydrochloride separates in crystals, and in ten minutes the reaction is at an end; the filtered solution contains glucosone, which can be isolated in the form of its insoluble lead compound.

Glucosone has not yet been obtained in crystals; its reactions show that it is the aldehyde of levulose,
 $\text{CH}_2(\text{OH}) \cdot [\text{CH}(\text{OH})]_3 \cdot \text{C} \cdot \text{O} \cdot \text{C} \cdot \text{O} \cdot \text{H}$, and its formation is expressed by the equation—



It combines with phenylhydrazine, yielding glucosazone; it gives crystalline quinoxaline, derivatives with aromatic orthodiamines, and on reduction with zinc-dust and acetic acid, it is completely converted into levulose.

It seems probable that other, as yet unknown, ketone-sugars can be obtained from the aldehyde-sugars by the same method as that employed in the transformation of dextrose into levulose. The inverse process, namely, the conversion of a ketone- into an aldehyde-sugar, has already been carried out as follows:—Levulose can be reduced to mannitol, which, on oxidation with nitric acid, gives the aldehyde mannose, and from the latter dextrose can be obtained in the manner described below.

The osazones may also be employed for ascertaining the molecular formula of a sugar, as was done in the case of arabinose, sorbinose, and xylose; also for determining its constitution, as exemplified by the case of rhamnose and lactose.

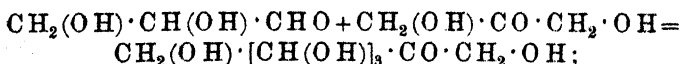
The hydrazones and osazones are also particularly valuable for the detection of new sugars and sugar-like substances, witness the case of mannose, the true aldehyde of mannitol, a sugar which, first prepared artificially by the oxidation of the alcohol, was soon afterwards detected in the vegetable kingdom by Tollens and Gans, and by R. Reiss, who named it seminose. Erythrose and glycerose, two sugar-like substances, obtained by the oxidation of erythrol and glycerol respectively, were also isolated by means of their osazones.

Glycerose, which is most conveniently obtained by the oxidation of glycerol with bromine and sodium carbonate, was proved to

have the molecular formula $C_3H_6O_3$ by the analysis of the osazone, but it is probably a mixture of glyceraldehyde and dihydroxyacetone; when treated with dilute alkalis, it gives α -acrose, for the formation of which glyceraldehyde is necessary, and it combines with hydrogen cyanide, yielding a cyanhydrin, which on hydrolysis is converted into trihydroxyisobutyric acid, a compound that can only be formed from dihydroxyacetone.

The first step in the synthesis of sugars was made by Butlerow (*Annalen*, cx. 295), the discoverer of methylenitan, a yellowish, sweet syrup, obtained by treating a hot solution of trioxymethylene with calcium hydrate; this substance shows the usual reactions of sugars, but is optically inactive, and seems not to ferment with yeast. The method of preparing formaldehyde having been greatly improved by Loew, it became possible to examine the condensation of this substance more fully, which soon led to the discovery of formose. This compound, which was obtained by Loew by the condensation of formaldehyde with calcium hydrate, was thought by him to be different from methylenitan, and to have the composition $C_6H_{12}O_6$; the author proved, however, that both substances consist of various sugar-like compounds, and are practically identical, the principal constituent of both being a sugar (formose) of the composition $C_6H_{12}O_6$, another sugar, α -acrose, being also present in the two mixtures. A little later Loew obtained a sugar, which he named methose, by the condensation of formaldehyde by the action of lead and magnesium oxides, but this product was proved by the author to be identical with α -acrose. In the meantime it was found that two isomeric sugars, α - and β -acrose, are formed when acraldehyde bromide is treated with a cold solution of barium hydrate; these two substances, which can be most conveniently prepared by treating glycerose with cold dilute alkalis, can be isolated from various other sugar-like substances, which are produced at the same time, by means of their osazones, the latter being reconverted into the sugars by treatment with hydrochloric acid, in the manner described above.

α -Acrose, which is only obtained in small quantities, seems to be formed by a sort of aldol condensation of equal molecules of glyceraldehyde and dihydroxyacetone, in accordance with the equation—



its formation from glycerose and from formaldehyde takes place

under conditions which exist in the vegetable kingdom, and is, therefore, of far greater interest than its preparation from acraldehyde bromide.

The remarkable resemblance of α -acrosazone to glucosazone, from which it differs principally in being optically inactive, at once led the author to suppose that α -acrose was the optically inactive form of dextrose or levulose. On decomposition with hydrochloric acid, α -acrosazone yields a sweet syrup which ferments with yeast, gives levulinic acid with hydrochloric acid, and, on reduction with sodium amalgam, is converted into a crystalline hexahydric alcohol, α -acritol, the resemblance of which to mannitol is so close that it was thought to be simply the inactive form of this naturally occurring alcohol. But for the fortunate discovery that α -acritol can be prepared from mannose, it would have been a task of considerable difficulty to prove its relationship to mannitol, as only 0.2 gram of α -acritol is obtained from 1 kilo. of glycerol.

When mannose, the aldehyde of mannitol, is oxidised with bromine-water, it is converted into a monocarboxylic acid, mannonic acid, $C_6H_{12}O_7$, which can be purified by means of the hydrazide by the method previously described. On evaporating an aqueous solution of the acid, a crystalline lactone, which differs from the lactone of arabinose-carboxylic acid only in possessing an opposite rotatory power, is obtained; when these two lactones are mixed together in aqueous solution, they combine to form an optically inactive lactone. On reduction with sodium amalgam in the manner already described, the three lactones are converted into a dextrorotatory, lævorotatory, and inactive mannose respectively; these sugars, on further reduction, yield the corresponding active and inactive mannitols, the inactive modification being identical with synthetical α -acritol.

Now, since *i*-mannitol is identical with the α -acritol obtained synthetically, and α -acrose, obtained from α -acrosazone, is identical with *i*-fructose, all that remains to complete the synthesis of a natural sugar is to convert a member of the inactive into a member of the active series. This can be accomplished in the case of the sugars themselves, through the agency of yeast. When an aqueous solution of synthetical α -acrose, (*i*-fructose) is fermented with yeast, the solution, which was previously inactive, becomes strongly dextrorotatory, and yields a glucosazone which is dextrorotatory; this solution contains a sugar which is named

Mannitol Series.

<i>l</i> -Fructose.	<i>i</i> -Fructose. (α -Acrose).	<i>d</i> -Fructose. (Fruit-sugar.)
	<i>i</i> -Glucosone.	<i>d</i> -Glucosone.

Mannose Group.

<i>l</i> -Mannonic acid. (Arabinosecarboxylic acid.)	<i>i</i> -Mannonic acid.	<i>d</i> -Mannonic acid.
<i>l</i> -Mannose	<i>i</i> -Mannose.	<i>d</i> -Mannose.
<i>l</i> -Mannitol.	<i>i</i> -Mannitol. (α -Acritol.)	<i>d</i> -Mannitol.
<i>l</i> -Mannosaccharic acid. (Metasaccharic acid.)	<i>i</i> -Mannosaccharic acid.	<i>d</i> -Mannosaccharic acid.

Glucose Group.

<i>l</i> -Gluconic acid.	<i>i</i> -Gluconic acid.	<i>d</i> -Gluconic acid.
<i>l</i> -Glucose.	<i>i</i> -Glucose.	<i>d</i> -Glucose. (Grape-sugar).

Alcohols wanting.

<i>l</i> -Saccharic acid.	<i>i</i> -Saccharic acid.	<i>d</i> -Saccharic acid.
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l-fructose, in spite of the fact that it is dextrorotatory, because the letters *d* and *l* do not denote in every case the irregularly changing rotatory power, but express rather the chemical relationship between the compounds; the letter *d* was chosen for the group of natural sugars, because most of them are dextrorotatory, and although levulose is lævorotatory, it belongs to the same geometrical series as *d*-mannose.

i-Mannose ferments with yeast just like *i*-fructose, the dextrorotatory modification being destroyed, and the lævorotatory modification remaining unchanged, so that in both cases the yeast uses that part of the sugar to which it has been accustomed in the past.

As fermentation gives the less interesting compounds of the *l*-series only, chemical methods have to be employed for obtaining the natural sugars. *i*-Mannitol, on careful oxidation with nitric acid, yields *i*-mannose, which is converted into *i*-mannonic acid by treatment with bromine-water; by means of its strychnine or morphine salt, this acid can be separated into *d*- and *l*-mannonic acids, which, on reduction, give the optically active mannoses and mannitols. The *d*-mannose obtained in this way can be transformed into *d*-fructose (levulose) by means of its glucosazone, which

is identical with that of dextrose and of levulose. The conversion of dextrose into mannose, and *vice versa*, can be accomplished by means of the acids. When gluconic acid is heated with quinine at 140° , it is partially converted into *d*-mannonic acid; the latter, under the same conditions, gives considerable quantities of *d*-gluconic acid, which on reduction yields *d*-glucose (dextrose), the synthesis of this natural sugar being thus completed.

l-Mannonic acid, in like manner, can be converted into the optical isomeride, *l*-gluconic acid, but the process is difficult to carry out, and the yield is small.

l-Gluconic acid can be more conveniently obtained, together with arabinosecarboxylic acid (*l*-mannonic acid), by treating arabinose with hydrocyanic acid and hydrolysing the product; this is the first instance of the formation of two stereo-chemical isomerides by the combination of an aldehyde with hydrogen cyanide.

The two active gluconic acids are very similar in appearance, and combine in aqueous solution, yielding an inactive acid which forms salts and other inactive derivatives; on reduction, they are converted into the corresponding optically active isomerides of dextrose, namely, *l*- and *i*-glucose, and on oxidation they yield *l*- and *i*-saccharic acid.

The isomerism of all the compounds included in the above table can be explained in accordance with Le Bel and Van't Hoff's hypothesis, but the views at present held on the combination of isomeric compounds containing asymmetrical carbon-atoms will probably have to be modified.

Since all the members of the mannitol series can be prepared from their elements, the most important natural sugars have now been synthesised; but it is possible to prepare artificially sugars containing 7, 8, 9, etc., carbon-atoms by converting one containing 6 carbon-atoms into the acid containing 7, by means of hydrogen cyanide, and then reducing the lactone of this acid with sodium amalgam. The sugar containing 7 carbon-atoms produced in this way can then be employed for continuing the process up the series; mannoheptose, mannooctose, and mannnononose have already been prepared.

Many of these new synthetical sugars will certainly be found in the vegetable kingdom, and, even already, it has been proved that the heptahydric alcohol, formed by the reduction of mannoheptose, is identical with perseitol, $C_7H_{16}O_7$, a compound which occurs in the fruit of *Laurus persea*.

The most interesting result of these investigations is, however, the synthesis of dextrose and levulose, which throws some light on one of the most important and wonderful physiological processes, namely, the formation of carbohydrates in green plants. As far as is known, these two sugars are not only the first products of assimilation, but they are also the material from which all other organic constituents of plants are prepared. Since it has not yet been proved that formaldehyde occurs in plants in any appreciable quantity, it seems probable that a search for other intermediate products, such as glycerose, might be attended with success. The fact that the active sugars only are formed in plants, whilst inactive acrose is alone produced by chemical synthesis, is still more interesting, as the question arises whether the formation of optically-active substances is a prerogative of plants—the result it may be of a kind of vital force? The answer to this question is probably in the negative, and it is, doubtless, but incomplete knowledge that gives an appearance of the wonderful to the process. No facts are known which directly negative the view that plants first prepare inactive sugars, and then split them up, making use of the members of the *d*-mannitol series for the production of starch, cellulose, inulin, etc., the optical isomerides serving to fulfil other functions.

The author discusses the problem what would be the effect if some of the artificial sugars were supplied to animals, instead of the natural products. Mannose, which is so nearly related to dextrose, would probably serve as nutriment, even to the more highly organized animals, and the slight change in food might produce corresponding changes in assimilation. The liver, for example, might secrete a new glycogen, the mammæ a substitute for lactose. The consequence of substituting a pentose or a heptose, or, more especially, the fermentable nonose, for ordinary sugar might be far more important, and it would not be surprising if, under such circumstances, the functions of the blood and the tissues were modified; the pig, for example, secreting a different fat, the bee a different wax. As, moreover, with the help of fungi, plants prepare not only the more complex carbohydrates and fats, but albuminoids as well, they might be forced to form different albuminoids if supplied with some new sugar; a change of architecture, under chemical influence, might in this way be brought about, which would lead to the most remarkable results, and produce changes of form more fundamental than it has yet been found possible to do by crossing and selection. Although in the

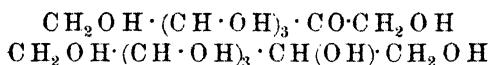
past hundreds of organic substances have been supplied to animals in order to determine what changes they undergo in the system. the materials used had invariably no resemblance whatever to natural food-stuffs; in the possession of new sugars, the physiologist will have a fruitful field of research, his labours in which are likely to lead to remarkable results.

New Synthetic Sugars. E. Fischer and F. W. Passmore. (*Pharm. Journ.*, 3rd series, xxi. 163.) The authors give a detailed account of their progression from *d*-mannohexose, $C_6H_{12}O_6$, to *d*-mannononose, $C_9H_{18}O_9$. The heptose, $C_7H_{14}O_7$, has been obtained pure and its physical constants determined. Octose, $C_8H_{16}O_8$, however, appears to possess very bad crystalline properties and its physical characters have therefore only been approximately described. On the other hand, the lactone of its carboxylic acid can be obtained crystalline comparatively easily, and yields a well-crystallized sugar, the nonose, upon its reduction with sodium amalgam. The formation of a characteristic insoluble phenyl-hydrazone suffices to distinguish mannonose from glucose. The octose also yields by direct reduction a very stable octavalent alcohol, the mannocite, $C_8H_{18}O_8$, a beautifully crystallizable product, which melts above $250^\circ C$, and volatilizes at a higher temperature. The nonose derives additional interest from its fermentability, the heptose and octose not being fermented by yeast. The authors point out as a fact of considerable physiological importance, that although sugars containing three, or a multiple of three carbon atoms in the molecule—as glycerose, $C_3H_6O_3$, most sugars with the formula $C_6H_{12}O_6$ and the nonose—are fermentable, yet solutions of the intermediate sugars containing four, five, seven and eight carbon atoms in the molecule do not afford a suitable pabulum for the ordinary yeast-plant. In reference to the possibility of these higher atomic saccharic compounds occurring in the vegetable kingdom the authors instance the already recorded identification of the mannoheptite with the heptavalent alcohol from *Persea gratissima*. If the ordinary six-carbon sugars are produced in plants by the condensation of two molecules of glycerin aldehyde, the discovery of a nine-carbon sugar in plant-life as a condensation product of three molecules of the same body is regarded as probable.

Conversion of Glucose into Sorbitol (Sorbite). J. Meunier. (*Comptes rendus*, cxi. 49–51). By reducing glucose dissolved in twice its weight of water, with an excess of sodium amalgam, then acidifying with sulphuric acid, neutralizing with barium

carbonate, filtering, concentrating by evaporation, precipitating the sodium sulphate by alcohol, and mixing the concentrated alcoholic filtrate with hydrochloric acid and benzaldehyde, the author obtained sorbite in the form of its dibenzoic acetal. If a weaker solution of glucose be employed, the yield of sorbitol is considerably lessened.

Reduction of Fruit Sugar. E. Fischer. (*Ber. der deutsch. chem. Ges.*, 1891, xxiii. 3684-3687.) In the reduction of fruit sugar to the hexavalent alcohol the carbon atom of the carbonyl is rendered asymmetrical, as is shown by the following formulæ:



On theoretical grounds the formation of two stereo-isomeric products might be expected in this reaction; but as hitherto only mannitol (mannite) had been obtained, the author considered it probable that a second stereo-isomeric alcohol might be produced in this reduction, and that this ought to be sorbitol (sorbite), which, according to recent observations by Mennier (see preceding abstract) is the alcohol corresponding to glucose. This supposition proved to be correct. By reduction of fruit sugar with sodium amalgam, mannitol and sorbitol were obtained in about equal proportions. The sorbitol thus obtained proved identical with the natural product from *Sorbus aucuparia*.

Synthetical Formation of a New Sugar from Glucose. E. Fischer. (*Ber. der deutsch. chem. Ges.*, xxiii. 3687-3691.) By the action of strong hydrochloric acid upon glucose, the author has obtained a new sugar, which he has isolated from the products of the reaction in the form of its osazone. The properties of the latter leave no doubt that the new sugar is similar in its constitution to maltose; and for this reason he proposes for it the provisional name of isomaltose. It may possibly be identical with the new sugar recently discovered by Scheibler and Mittelmeier in commercial dextrin.

The author expresses a hope that in a similar manner the isomerides of glucose may be made to yield the corresponding compounds of the formula $\text{C}_{12}\text{H}_{22}\text{O}_{11}$.

Fermentation of Starch by the Butyric Ferment. A. Villiers. (*Comptes rendus*, cxii. 435-437 and 536-538.) The author finds that the butyric ferment converts starch directly into dextrin without the intervention of any diastase secreted by the organism. After removal of the dextrin by alcohol, the filtered alcoholic

liquid yields a crystalline body having a slightly sweet taste and answering to the formula $6C_6H_{10}O_5, C_2H_6O, 5H_2O$.

After the starch has been completely fermented, there remains an insoluble, bulky, white, flocculent residue which agglutinates on drying. It has the composition of cellulose, and is very slowly converted into glucose when boiled with dilute inorganic acids.

Alcoholic Fermentation of Invert Sugar. U. Gayon and E. Dubourg. (*Comptes rendus*, cx. 865-868.) When invert sugar is fermented with ordinary yeasts, the lœvorotatory power gradually increases, attains a maximum, and then decreases, finally becoming nil. This series of changes is due to the fact that the dextrose ferments more rapidly than the levulose. The curve is shown by the author to be constant for the same species of yeast under the same conditions, but to vary considerably with different species.

Gallisin. C. Scheibler and H. Mittelmeier. (*Ber. der deutsch. chem. Ges.*, xxiv. 301-305.) The authors find that this substance is wanting in all the properties of a definite chemical compound, and the formula $C_{12}H_{24}O_{10}$, assigned to it by Cobenzl, Rosenbeck, and Schmitt, cannot be regarded as based on established facts.

Gallisin, purified by repeated precipitation by alcohol from its aqueous solution, is a colourless, amorphous, very hygroscopic substance; it is very readily soluble in water, the solution having a neutral reaction, and a powerful reducing action on Fehling's solution. When its aqueous solution is heated at 100° for about an hour with phenylhydrazine acetate, and then allowed to cool, a considerable quantity of a yellow osazone is deposited. This compound, purified by recrystallization from hot water, has the composition $C_{24}H_{32}N_4O_9$.

Action of Light on Acetic Fermentation. M. Giunti. (*Bied. Centr.*, xix. 490, 491.) The author's results showed that direct sunlight hinders the development of the *Mycoderma aceti*, and consequently the acetic fermentation; even diffused daylight hinders the development if the surface of the liquid is not shaded. Prolonged sunlight did not, however, sterilize the liquid inoculated with *Mycoderma*, but it might be possible to hinder the formation of acid in wines in this way.

The Bouquet of Wines. G. Jacquemin. (*Comptes rendus*, cx. 1140-1142). The author confirms an observation made a short time ago by A. Rommier (*Year-Book of Pharmacy*, 1890,

134), respecting the influence of yeast on the bouquet of wines. The same must, when fermented with yeast cultures obtained from various districts, yields products having the characteristic bouquets of wines of those districts. Even in a plain solution of sugar, these cultivated yeasts develop the characteristic bouquets belonging to their wines in a marked manner.

The Digestive Ferment in Fig Sap. U. Mussi. (*L'Orosi*, November, 1890, 364; *Pharm. Journ.*, 3rd series, xxi. 560.) Juice collected from the fruit and branches of the fig was filtered to remove the serous portion from the insoluble, the latter repeatedly washed with water and the washings added to the filtrate. This liquid, which after repeated filtration was obtained limpid, was distinctly acid in reaction, and when placed in contact with moist fibrin digested it completely. It was evaporated to a small volume, again filtered, and treated with absolute alcohol, which threw down a plentiful white precipitate drying, on exposure to air, to a dark yellow amorphous mass. This, when treated with water, swelled up and imparted a milky appearance to the liquid; but a clear filtrate from it, though it gave the reactions of vegetable albumen, had no digestive power. The residue, insoluble in water, dissolved readily upon the addition of a trace of acid or alkali, and the solution, placed in contact with moist fibrin effected complete and true digestion. To the ferment thus isolated the author gives the name "cradina," from *krade*, the name given by the Greeks to the part of the fig with which they specially associated the digestive property. It contains nitrogen, and in the dry state it forms a friable, semi-transparent, dark yellow, amorphous mass, yielding an amber-yellow powder. In water it swells, but does not dissolve, though upon being shaken it imparts to the liquid a milky appearance. When dissolved by the aid of alkali or acid, a concentrated solution is dark yellow, but becomes colourless upon being diluted. Cradina differs from pepsin in maintaining its digestive power in an alkaline liquor, and from papain or papayotin in being insoluble in water, not precipitated from solution by alcohol or lead acetate, and in its activity not being diminished in the presence of hydrochloric acid. In a neutral liquid it is devoid of digestive power and it has no action upon starch.

Importance of Chlorine in the Plant. C. Aschoff. (*Ann. Agron.*, xvi. 275-277). The author has experimented with common haricots, Spanish haricots, and maize, growing them in a nutritive solution containing magnesium sulphate, potassium

chloride, calcium nitrate, potassium phosphate, and a trace of ferric chloride; also in the same solution, with the potassium chloride omitted and the ferric chloride replaced by ferric pyrophosphate; and in pure water. His results lead him to infer that the presence of chlorides is a necessary condition to growth and development, at any rate in the case of the three plants experimented with.

Occurrence of Boric Acid in the Vegetable Kingdom. E. Hotter. (*Landw. Versuchs-Stat.*, xxx. 437-458.) The author confirms the frequent occurrence of boric acid as a plant constituent. A large number of ashes of fruits, leaves, and twigs of fruit trees and portions of other plants were tested, and boric acid was found in the ashes of all the fruits, and smaller quantities of it in some of the other parts.

Aspergillin, a Vegetable Hæmatin. G. Linossier. (*Comptes rendus*, cxii. 489-492.) The spores of *Aspergillus niger*, when treated with very dilute ammonia, yield a dark-coloured solution, from which a slight excess of hydrochloric acid throws down a black, bulky, flocculent precipitate, which the author calls *aspergillin*. When dried over sulphuric acid and powdered, it closely resembles hæmatin in appearance, and its general resemblance to this substance has led to the adoption of the term "vegetable hæmatin."

Vegetable Hæmatin. T. L. Phipson. (*Comptes rendus*, cxii. 666-667). The author is of opinion that the body described by Linossier (preceding abstract) is probably identical with *palmeline* obtained by him (Phipson) from *Palmella Cruenta*. This plant, formerly known as *Chaos sanguinea*, is green, but changes to blood-red towards the end of vegetation.

Chemical Theory of the Coagulation of Blood. M. Arthus and C. Pagès. (*Comptes rendus*, cxii. 241-244.) The authors arrive at the conclusion that under the influence of the fibrin ferment, and in presence of calcium salts, the fibrinogen of the blood plasma is decomposed into two substances, namely, an insoluble, calciferous compound, fibrin, and a soluble compound, globulin, which coagulates at 64°.

Influence of Salts on Clotting. S. Ringer and H. Sainsbury. (*Journ. Physiol.*, xi. 369-383.) The authors confirm the observation that calcium salts are essential to the act of clotting, both in milk and blood. The chloride was found to be very efficient in this respect. Strontium and barium act like calcium, but are less powerful. The action of all three metals is largely

controlled by the solubilities of their salts. Potassium and sodium salts, on the other hand, have a restraining influence on coagulation, the latter metal being the more powerful in this direction. There is antagonism between the salts of the alkaline earths on the one hand, and those of the alkaline metals on the other.

Hermann's theory that contraction and coagulation are analogous phenomena receives strong support from the experiments described in this paper.

The Proteïds of Milk. W. D. Halliburton. (*Journ. Physiol.*, xi. 448-463; *Journ. Chem. Soc.*, March, 1891, 339.) Attention is drawn in this paper to the following points:—

(1) The principal proteïd in milk precipitable by saturation with certain neutral salts or by acetic acid, should be called *caseïnogen*. It may be most satisfactorily prepared free from impurities by a combination of the two methods just mentioned. The term *caseïn* should be restricted to the curd formed from caseïnogen by the action of rennet.

(2) In the classification of proteïds, caseïn should be grouped with other insoluble proteïds, like fibrin and gluten, formed by ferment activity from pre-existing more soluble proteïds. Caseïnogen should be classified in a new group, made to include it and whey-proteïd. These are very similar to the globulins, the chief difference being that their solutions are not coagulated by heat like the globulins, but only rendered opalescent. This opalescence, if the heating has not been continued too long, disappears on cooling.

(3) Lactalbumen is very similar in its properties to serum-albumen. Not only does it differ, however, from serum-albumen in its specific rotatory power, as has previously been shown, but in its behaviour on heat-coagulation, and in precipitability by certain neutral salts.

(4) Caseïnogen and lactalbumen are the only proteïds contained in milk. The proteïd described as lactoglobulin does not exist; it is owing to the error of not recognising that the two salts, sodium chloride and magnesium sulphate, when both present to saturation, precipitate albumen, that this proteïd has been supposed to exist. The proteïds variously called lactoprotein, peptone, and hemialbumose do not exist in milk. This mistake has also arisen from faulty methods of analysis.

(5) The proteïd called whey-proteïd, which passes into solution simultaneously with the formation of the rennet curd, is not of the peptone or proteose class, but should be included with casei-

nogen in a new class of proteïds allied to the globulins. It differs from caseinogen in not being convertible into casein.

(6) When milk turns sour owing to the lactic acid fermentation, primary proteoses, chiefly proto-proteose, are developed.

Composition of the Milk of Cows during Early and Late Periods of Lactation. M. Kühn. (*Bied. Centr.*, xix. 622-628.) Experiments were made with cows in early and late periods of lactation, in order to determine the difference in the amount and quality of the milk with cows of the same kind, and of about the same weight, under the same conditions as to feeding. The results show that considerably more milk is produced in early than in late periods, but that the milk of the latter contains rather more dry matter, fat and proteïn, than that of the former. The amount of ash and lactic acid is about the same in both cases. In the late period, the amount of dry substance, milk-sugar, and fat, varies more than in the early period, when the reverse was observed, but in less degree, regarding the other constituents.

Preparation of Soluble Casein. A. Béchamp. (*Bull. de la Soc. Chim.* [3], iv. 181-186.) Pure acetic acid is added drop by drop to the milk just drawn from the cow or goat, until the latter turns litmus-paper a pale pink; the coagulum which soon separates is collected, and, after drying by a filter pump, is treated with ether to remove fat. It is then suspended in an equal volume of water containing ammonium carbonate, and the mixture is filtered. The filtrate is mixed with acetic acid in just sufficient quantity to precipitate the casein, which, by a repetition of the above treatment, is obtained pure.

Egg Albumen free from Ash. E. Harnack. (*Ber. der deutsch. chem. Ges.*, xxiii. 3745-3752; *Journ. Chem. Soc.*, April, 1891, 476.) The author gives further details of the method employed for the preparation of pure albumen free from ash by treatment of the copper derivative with concentrated potash. The albumen so obtained is soluble in boiling water; the addition of alcohol causes no change, but neutral salts immediately produce a flocculent precipitate. On heating the moist preparation under water, it melts before dissolving. Ammonium sulphate yields a crystalline albumen derivative, which, however, only contains about 5 per cent. of albumen. Pure albumen reddens blue litmus-paper, and is not precipitated from solution by many organic acids, such as formic acid, acetic acid, tartaric acid, citric acid, or lactic acid. The precipitate caused by most mineral acids consists of unaltered albumen, as is proved by the fact that after filtration and washing

it is soluble in water. Alkalies prevent the precipitation of albumen by neutral salts. Free albumen, even in presence of moisture, shows no tendency to ferment or decay.

The paper closes with a discussion of the part played by albumen in the animal economy.

Action of Glycerine on Egg Albumen. V. Grandis. (*Rend. Acad. Lincei*, vi. 138-145. From *Journ. Chem. Soc.*) Berthelot found that when glycerine is left in contact with albumen, it is converted into sugar, and suggested that, in virtue of this reaction, sugar might be formed from the animal fat. The author has examined the change produced by the reaction in the albumen. Purified egg albumen was boiled with an equal volume of pure glycerine (sp. gr. = 1.25) for one-half to one hour, filtered, and the filtrate extracted with at least 10 vols. of alcohol (90°) containing a little ether. The extract is a milky liquid which in a day or two leaves a white, flocculent deposit; this dissolves in boiling water, forming a heavy, opalescent solution, not coagulated by boiling, and unaffected by the addition of acetic or hydrochloric acids, or of a concentrated solution of sodium chloride. The addition of a concentrated solution of sodium sulphate or chloride, together with a drop of acetic acid, produces a flocculent precipitate soluble in the boiling liquid. Concentrated nitric acid gives a precipitate which dissolves on heating, forming a pale yellow solution, which acquires a reddish violet colouration on the addition of soda and a drop of copper sulphate. It is also precipitated by the other reagents for proteids. In its reactions it strongly resembles hemialbumose, but it does not appear to have the same percentage composition, approximating in this respect to anti-peptone. It is probably identical with the compound obtained by Hönig, but if so, its alleged solubility in alcohol and ether must be due to the use of a quantity of the solvent insufficient to precipitate it from its solutions. It appears to be formed by the direct action of glycerine on albumen, since it may be obtained without the aid of heat by leaving the two substances in prolonged contact at the ordinary temperature. Assuming that the proteid is hemialbumose, it is probable that as a first step to its conversion into sugar, the glycerine is dehydrated and converted into acraldehyde.

When an aqueous solution of the purified proteid is treated with a quantity of alcohol insufficient to form a precipitate, and allowed to remain for about three months, a crystalline deposit of very thin, brilliant, rhomboidal, curved plates is formed. These

crystals are insoluble in hot water, and in concentrated sulphuric acid and potash, they are turned yellow by iodine, but are not affected by Millon's reagent, and do not react with alloxan.

Cholesterin Fats in Man. O. Liebreich. (*Chem. Centr.*, 1890, ii. 149-150.) The author has detected cholesterin fats on human skin and hair, the feathers and beaks of birds, and the hoofs of horses. Lanolin was found in human vernix caseosa.

Destruction of Sugar in the Blood by a Ferment. R. Lépine and M. Barral. (*Comptes rendus*, cx. 1314-1316; cxii. 146-148, and 411-412.) The authors' experiments confirm the existence in the blood, and especially in the chyle, of a *glycolytic* ferment, possessing the power of destroying glucose. This ferment is excreted chiefly, though not solely, from the pancreas. Its action is accelerated by a rise of temperature. It disappears in the blood of patients suffering from diabetes. The destruction of glucose does not appear even partly due to living blood albumen, but entirely to this soluble ferment. The latter may be isolated from defibrinated blood by separating the corpuscles from the serum, and repeatedly extracting the former with solution of common salt.

Detection of Carbonic Oxide in Blood. M. Rubner. (*Zeitschr. für analyt. Chem.*, xxx. 112.) The blood is shaken for a minute in a test-tube with four or five volumes of lead acetate solution. Blood containing carbonic oxide remains red, whilst normal blood becomes brownish, and ultimately chocolate-brown and greyish brown. The difference is still recognisable when the carbonic oxide blood is diluted with eight or nine volumes of normal blood.

Detection of Carbonic Oxide in the Blood. A. Wetzell. (*Chem. Centr.*, 1889, 738-739.) The author recommends the following tests:—10 c.c. of the blood, 15 c.c. of 20 per cent. potassium ferrocyanide solution, and 2 c.c. of acetic acid (1 vol. glacial acetic acid : 2 vols. water) are mixed, and shaken gently. Coagulation ensues, the mass gradually becoming solid. If normal blood only is present, the mixture is dark brown coloured; but in the presence of carbonic oxide, the colour is light red. In the latter case, the colour of the mass becomes gradually dark brown at the top, this change proceeding gradually towards the bottom. If only a very small quantity of blood is available, it is diluted with 4 to 10 vols. of water, and to 10 c.c. of this mixture, 5 c.c. of the potassium ferrocyanide, and 20 drops of the acetic acid are added.

A still more delicate test is the following:—The blood is diluted with 3 vols. of water, then mixed with 3 vols. of a 1 per cent. tannin solution, and well shaken. At the end of twenty-four hours,

normal blood has a grey colour, whilst carbonic oxide blood becomes carmine-red. This test is very delicate, and 0·0023 per cent. of carbonic oxide in the air was detected by its means.

The author finds that blood containing 26·5 per cent. of carbonic oxide causes a single wide band in the spectrum.

Composition of the Pancreatic Juice in Man. J. Zawadski. (*Medical Chronicle*, April, 1891.) The pancreatic juice analysed by the author was obtained from a patient, who had been operated upon for the removal of a pancreatic cyst. For fourteen days an abundant secretion appeared, at first purulent, then watery. After four weeks the wound healed completely.

The pancreatic juice for twenty-four hours was collected and analysed. It was tenacious, yellowish, turbid, and had an alkaline reaction. The deposit contained large epithelial cells, mucous corpuscles, and fine granular detritus, but no crystals. In the ashes were found compounds of carbonic, sulphuric, phosphoric and hydrochloric acids. The bases were sodium, calcium, potassium and iron. The juice contained coagulable albumen and hemi-albumose, but no peptone.

By the action of the juice on starch for five hours, at a suitable temperature, maltose was obtained. The action of the juice for four hours on the white of egg gave peptone only, and neither albumen nor propeptone.

The analysis gave the following results:—

	Per cent.
Water	86·405
Solids	13·895
Organic Compounds	13·251
Albuminous Bodies	9·205
Extractives	4·046
Other Extractives soluble in Alcohol	0·827
Salts	0·344

Effect of Salt on Digestion. A. Stutzer. (*Journ. Chem. Soc.*, June, 1891, 752.) The questions which the author endeavours to answer are:—Will pepsin dissolve as much albumen when sodium chloride is present as when it is absent; and has sodium chloride a specific action on the pepsin, or on the hydrochloric acid, or on both? The solutions employed were:—(1) water; (2) water and sodium chloride; (3) water and hydrochloric acid; (4) water, sodium chloride, and hydrochloric acid; (5) acidified stomach juice; (6) sodium chloride. The material acted on was cotton-seed meal soaked in chloroform-water, the temperature 40°, the time thirty

minutes. Results:—Salt alone has no appreciable action. Hydrochloric acid even in 0·05 per cent. solution has a very considerable solvent power, provided sodium chloride be present to the extent of only 0·25 per cent. Increase of sodium chloride means decrease of solvent action; increase of acid to 0·2 per cent. with small amount of salt, 0·25 per cent., is accompanied by increase of solvent power (53–71), but 1 per cent. of sodium chloride hinders the action of the acid. 1 per cent. of salt causes pepsin to dissolve more albumen than 0·25 or 0·5 per cent. of sodium chloride in the presence of acid. Pepsin solutions with salt added are capable of dissolving more albumen than when salt is absent; the most advantageous conditions under which salt acts are when 0·05 or 0·10 per cent. of hydrochloric acid is present.

Influence of Cooking on the Digestion of Beef and Fish. M. Popoff. (*Zeitschr. physiol. Chem.*, xiv. 524–532.) The author's results were as follows:—

1. Raw flesh is more easily digested than that which has been boiled; this difference is more apparent with beef than fish.

2. The length of time that the boiling lasts has also an effect; indigestibility and prolonged boiling, especially in the case of beef, going together.

3. After the two varieties of flesh have been cooked equally, beef is more digestible than fish.

4. The smoking of fish favours its peptonization; this is true for both raw and cooked smoked fish. In the case of beef, smoking has just the opposite effect.

5. Admixture of fat with fish does not hinder its digestion, as is the case with mammalian meat, but rather assists it.

Effect of Saccharin on the Digestion of Albuminoids. A. Stutzer. (*Landw. Versuchs-Stat.*, xxxviii. 63–68.) The author carried out the following experiments with earth-nut cake, the albuminoids of which are very quickly digested:—(1) experiments with saccharin without gastric juice or hydrochloric acid; (2) action of varying amounts of saccharin on 100 milligrams of nitrogen, in the form of digestible albumen, in presence of 0·05 per cent. of HCl; (3) same as (2), but with gastric juice also; (4) same as (3), but with 10 per cent. and 15 per cent. HCl respectively. The results of experiments (1) show that the solubility of albuminoids in water is considerably lessened by the presence of saccharin. In the experiments with gastric juice and acid there was a distinct disturbing influence exercised by saccharin, although the action

was less marked in the experiments in which the stronger acid was used.

Formation of Cystin in Pancreatic Digestion. E. Kälz. (*Zeit. Biol.*, xxvii. 415-417.) In examining the products of an artificial pancreatic digestion of proteïds, the author noticed that no sulphuretted hydrogen was evolved. The insoluble products were removed by filtration, and the filtrate concentrated; during this process, a precipitate formed, but after removal this was not found to contain cystin. The final filtrate, after a time, deposited a white precipitate insoluble in water, but soluble in ammonia. The ammoniacal solution was diluted with large quantities of water, and six-sided crystals separated, which, after purification by recrystallization, gave all the reactions of cystin. This observation seems to throw some light on the question as to what becomes of the sulphur of proteïds during digestion. It remains to be shown, however, that the formation of cystin under such circumstances is a normal occurrence.

Cystin in Urine. S. Delépine. (*Proc. Roy. Soc.*, xlvii. 198.) The examination of several specimens of urine from which cystin was deposited led to the following conclusions:—

1. That the simple addition of an acid in which cystin is not soluble is not sufficient to separate cystin from the urine, and therefore that the theory generally held as to the state of combination of cystin in the urine is probably inaccurate.

2. That a compound exists in certain urines which, under the influence of a fermentation, yields cystin.

3. That the fermentation is due to the growth of an organism which can seemingly be separated from the urine by ordinary filtration, and must therefore be a large organism, possibly a torula.

4. That the cases recorded in which cystin has been found deposited in the kidneys and liver indicate that the fermentation may begin in the organism.

Albumen and Globulin in Urine. D. Noel Paton. (*Brit. Med. Journ.*, ii. 1890, 196-201.) It was Senator who first stated that in all cases of albuminuria both of the chief proteïds of the blood-plasma (serum-globulin and serum-albumen) are present. The proteïd quotient (that is, the ratio of albumen to globulin), may, however, vary within wide limits; in the present observations between 0.6 and 39. In acute nephritis, when blood is absent, the quotient is high. When hæmoglobin is present, the globulin is of course in excess. As the disease becomes more chronic, the quotient sinks.

This alteration depends probably on the condition of the patient, and may correspond to a similar change in the blood-plasma. Waxy degeneration of the kidneys cannot be distinguished from the ordinary forms of nephritis by the high proportion of serum-globulin as was formerly maintained by Senator; Maguire's suggestion that functional albuminuria is characterized by a high proportion of serum-globulin, is also incorrect. In every case the quotient varies much in the course of the day, the proportion of globulin being always highest in the night; its greatest fall is after breakfast, and in most cases it rises again in the evening. Milk diet, as observed by Lecorché and Telamon, has a peculiar effect in increasing the proportion of serum-albumen. The amount of proteids passed appears to bear a direct proportion to the amount of proteids ingested, and, excluding milk diet, the increase of the proteids in the urine on a diet rich in those substances, seems to be chiefly due to an increase in the serum-albumen. The variation in the proportion of the albumen to the globulin in the urine is frequently so great that it can hardly be believed to be connected with a similar change in the plasma. The experiments performed would, however, suggest that a high pressure favours the transudation of serum-albumen, whilst a low pressure increases the proportion of serum-globulin transuded.

The Influence of Copious Water Drinking on the Excretion of Uric Acid. B. Schöndorff. (*Pflüger's Archiv*, xlv. 529-551.) The author's experiments lead to the conclusion that copious water drinking increases the excretion of total nitrogen in the urine, but has practically no influence on the elimination of uric acid. The following table is given:—

Condition of Experiment.	Total Nitrogen.	Uric Acid.
Ordinary Diet	18.5 grams.	1.18 grams.
Ordinary Diet + 2,000 c.c. Water	20.4 "	0.93 "
Ordinary Diet + 4,000 c.c. Water	20.6 "	1.01 "
Ordinary Diet + 10,000 c.c. Water	23.1 "	1.14 "

Ammoniacal Fermentation of Uric Acid. F. and L. Sestini. (*Landw. Versuchs-Stat.*, xxxviii. 157-164; *Journ. Chem. Soc.*, December, 1890, 1399.) Uric acid, suspended in water, may be kept for more than a year without undergoing any change, but the addition of a very small amount of decomposed urine causes it to decompose quickly and completely in hot weather. Pure uric acid (4 or 6 grams) was put into a large flask with distilled water (4 or 6 litres) and urine (1 to 2 c.c.) added. By means

of a suction pump, 2 litres of air was made to pass through the liquid four or five times a day. In another experiment, a stoppered flask was employed; this was frequently shaken and opened. In a few days the liquid became alkaline from the formation of ammonium carbonate, and the amount of suspended uric acid diminished until, in seven or eight days, it disappeared entirely. In twelve or thirteen days the whole of the uric acid was changed into ammonium carbonate. The reaction is expressed thus: $C_5H_4N_4O_3 + 8H_2O + 30 = 4NH_4HCO_3 + CO_2$. In another experiment, made at a temperature of 20° , the uric acid was almost all decomposed in twenty days, when the experiment was stopped. It was found that only a little more than half the total nitrogen was present as ammonia, the rest being in organic compounds.

In a third experiment, with a temperature of $22-28^\circ$, nearly all the uric acid disappeared within seven days. On the eighth day, a part of the liquid was taken out, filtered, and distilled. The result showed that about $\frac{1}{2}$ of the uric acid was converted into ammonium carbonate and the rest into carbamide. Another portion of the liquid, not filtered, was kept for eight days longer, when it was found that the whole of the uric acid was converted into ammonia. It is possible that further investigation may show that other compounds besides carbamide (alloxan, for instance) are formed as intermediate products.

The Occurrence of Hæmatoporphyrin in Urine. E. Salkowski. (*Centr. med. Wiss.*, 1891, 129-130.) The occurrence of this pigment in urine recorded by MacMunn (*Proc. Physiol. Soc.*, 1890, 13) and by Ranking and Pardington (*Lancet*, ii. 1890, 607), has now also been observed in three cases by the author, who attributes the phenomenon to the fact that sulphonal was taken medicinally at the time.

Excretion of Balsams in the Urine. R. Stockman. (*Lab. Reports*, College of Physicians, Edinburgh, iii. 65-69.) The author has experimented with the balsams of the British Pharmacopœia (balsam of Peru, balsam of Tolu, prepared storax, and benzoin), in order to test the truth of an assertion, that nephritis was likely to be caused by the administration of these bodies. He finds that the urine after the administration of Peruvian balsam or storax reacts with nitric acid in a similar manner as if albumen were present, but that the precipitate is soluble both in alcohol and in an excess of nitric acid, and therefore does not consist of albumen. He attributes the precipitate to the resinous constituents of the balsams.

Elimination of Naphthol with the Urine. E. Desesquelle. (*Comptes rendus Soc. Biol.* [9], xi. 101-104.) After the external application of naphthol in the form of an ointment it can be detected in the urine. The urine is evaporated to dryness, the residue dissolved in ether, the filtered ethereal solution again evaporated, and the residue dissolved in chloroform; it is then treated with soda and afterwards with sulphuric acid, when the green coloration characteristic of naphthol is developed.

Detection of Indigo-red in Urine. O. Rosenbach. (*Zeitschr. für analyt. Chem.*, xxix. 240.) Certain pathological urines, when oxidized by nitric acid, yield a deep burgundy-red to blue-red colour, which, by further action of nitric acid, passes into yellow. To the fresh urine, decolorized by lead acetate, filtered, and heated to boiling, nitric acid is added drop by drop until the purple colour is produced; the heating is then stopped, and ammonia added to alkaline reaction, whereon the red colouring matter is precipitated in an impure state. It is collected, washed with ammonia, dilute hydrochloric acid, and water, then dissolved in boiling alcohol. The solution deposits indigo-blue on cooling. The filtrate is purified from a brownish substance by alcoholic lead acetate, and most of the alcohol distilled off. The residue is mixed with much water, when a dark brown powder separates, which, after crystallization from ether or chloroform, shows the reactions of indirubin. A small specimen of the urine may be tested by adding nitric acid while boiling, then cooling, supersaturating with ammonia, and shaking with ether. A purple coloration of the ether shows the presence of indirubin. Urines which contain the chromogen of indigo-red give a more or less pronounced violet colour with Jaffé's indican test.

Volumetric Estimation of Chlorine in Urine. A. Corvi. (*L'Orosi*, 1890, 253; *Pharm. Journ.*, 3rd series, xxi. 247.) To 10 c.c. of urine, acidified with a few drops of nitric acid, a measured quantity of decinormal silver nitrate solution, more than sufficient to precipitate all the chlorine, is added and the solution filtered. The excess of silver nitrate present in the filtrate is then determined by titration with a decinormal potassium ferrocyanide solution, using ferric sulphate as an indicator. The silver is precipitated as a ferrocyanide according to the equation, $K_4Fe(CN)_6 + 4AgNO_3 = Ag_4Fe(CN)_6 + 4KNO_3$. The end of the reaction is indicated by the appearance of the azure blue colour of ferric ferrocyanide, which does not disappear by continual stirring until all the silver nitrate is decomposed. From the quantity of ferro-

cyanide solution used, the amount of silver removed as chloride may be easily calculated. The author reports that the method gives very accurate results.

Estimation of Uric Acid in Human Urine. W. Camerer. (*Zeit. Biol.*, xxvii. 153-171.) The method adopted for the estimation of uric acid consists in estimating the nitrogen in the precipitate of uric acid produced by silver nitrate. In order to avoid the lengthy and troublesome method proposed by Ludwig, it is recommended that the quantity of uric acid in the silver precipitate be calculated from the nitrogen determined by the author's method, a correction being made for the average error of $\frac{1.0}{100}$ to which this process has been shown to be liable. The following example is given: The silver precipitate of 150 c.c. of the diluted urine yielded 14.39 milligrams of nitrogen, or 9.6 per 100 c.c. $9.6 \times 3 = 28.8$ = the quantity of uric acid by the author's method. The quantity found by Ludwig's method was 26.0. Taking the mean difference as .11 instead of .109, the true amount of uric acid can be calculated from the author's number, thus: $28.8 - (28.8 \times .11) = 25.6$, which is nearly the same number as that obtained by direct analysis. If several analyses be made, and the mean taken, the results as shown in a table are practically identical in those obtained by calculation and by experiment.

Volumetric Estimation of Albumen in Urine. F. Venturoli. (*Chem. Centr.*, 1890, 795-796.) To 5 c.c. of urine, 6 c.c. of a 5 per cent. solution of potassium iodide is added, together with a few drops of acetic acid. A 1:100 solution of mercuric chloride is then added drop by drop until a permanent yellowish red coloration is produced. From the number of c.c. used, 1 c.c. is deducted as the quantity which has combined with the potassium iodide, and the remainder is multiplied by the factor 0.0245. If the urine should contain any alkaloid, the results are too high.

New Test for Albumen in Urine. A. Jolles. (*Zeitschr. für analyt. Chem.*, xxix. 406.) On mixing 10 c.c. of the urine to be tested with an equal volume of concentrated hydrochloric acid, and then placing three drops of a saturated solution of bleaching powder carefully on the surface of the mixture by means of a pipette, a white turbidity will be produced on the surface if albumen be present, provided the latter does not amount to less than 0.01 gram per 100 c.c. of urine. Since the nitric acid test permits of the detection of 0.0015 gram per 100 c.c., it is possible to make an approximate determination of the albumen by diluting the urine until the first test ceases to give an indication while the second

test still shows the albumen; the percentage will be known to be between the minimum limits above named.

The Ferrocyanide Test for Albumen in Urines. A. Jolles. (*Zeitschr. für analyt. Chem.*, xxix. 407-408.) The author considers the test with acetic acid and potassium ferrocyanide as the most delicate one for the detection of albumen in urine, especially if the urine be filtered before applying the test, and the mixture of urine and reagent carefully compared with the clear urine. In this manner it is possible to detect albumen even if present in traces amounting to only 0.0008 gram per 100 c.c. In the case of bacterial urine which cannot be rendered clear by filtration, the author recommends that the urine be first shaken with infusorial earth, after which a clear filtrate can be obtained. In such cases traces of albumen may adhere to the precipitate, from which they can be removed, however, by washing with warm potash solution. After this treatment the clear filtered liquid will respond to the test with great precision.

Detection of Bile Pigments in Urine. S. Kathrein. (*Pharm. Post.*, 1890, 845.) To 4 or 5 c.c. of slightly warmed urine 5 to 10 drops of tincture of iodine are added, agitating after the addition of each drop; in the presence of biliary pigments a pretty olive-green coloration is produced. Excess of tincture of iodine will produce a dirty brown-red colour; normal urine at first decolorizes the iodine solution, then gives a red coloration, and on addition of an excess of iodine a dirty brown-red colour.

Detection of Bile Constituents in Urine. A. Jolles. (*Pharm. Journ.*, from *Zeitschr. für analyt. Chem.*, xxix. 402.) Of the various tests used for the detection of bile-pigments in urine, the author recommends those of Rosenbach and Huppert on account of their delicacy and facility of application. The delicacy of the former test is further increased by the employment of nitric acid containing nitrous acid. If a drop of this reagent be allowed to fall upon a filter-paper saturated with the urine under examination, and the paper be then passed three or four times through a Bunsen flame, the presence of the slightest trace of biliverdin is indicated by the formation of a bright green ring round the nitric acid drop. The trustworthiness of Huppert's test depends largely upon the concentration of the milk of lime employed, a point to which no attention has been called. The author finds that the best results are obtained by shaking 8 to 10 c.c. of urine with an equal volume of milk of lime containing 10 grams of CaO in the litre. Upon treatment of the precipitate with alcohol and dilute

hydrochloric acid and boiling the filtrate therefrom, the liquid assumes a green or blue coloration if bile-pigments be present. The author also introduces a method for the determination of pericdical variation in the amount of bile constituents present, based upon the iodine absorption of the urine. The amount absorbed by urine free from pathological impurities depends principally upon its normal constituent, uric acid, and is fairly constant. Calculated from the formula

$$I = \frac{g}{s-1} \cdot 4.292,$$

where g is the number of grams of iodine absorbed by 10 c.c. of filtered urine at ordinary temperatures, and s the specific gravity of the urine, the value of I for normal urine ranges from 6.5 to 8, but never exceeds the latter figure. On the other hand, the presence of traces of bile constituents in the urine causes its iodine absorption value to rise to 10 and upwards, according to the extent of the contamination. It is necessary, however, to bear in mind the possibility of these figures being affected by medicines which the patient may be taking.

Estimation of Acetone in Urine. H. Huppert. (*Zeitschr. für analyt. Chem.*, xxix. 632.) 100 c.c. of the urine are distilled with 2 c.c. of pure acetic acid of 50 per cent. If nitrous acid be present, a third distillation, this time with urea, should be resorted to. The final distillate is now free from phenol, ammonia, and nitrous acid, and is therefore well suited for the estimation of acetone by Messinger's method.

Estimation of Sugar in Urine. U. Haussmann. (*Pharm. Journ.*, 3rd series, xxi. 379.) The author advocates the rejection of methods of sugar estimation in urine based upon the reduction of copper or bismuth salts. Further, since the precipitate with phenylhydrazine frequently contains so much brown amorphous matter that the presence of the characteristic sugar compound is concealed, whilst polarimetric determinations of dextroglucose may be vitiated by the presence of other optically active compounds in the urine, the author recommends the fermentation of the liquid with yeast. For a qualitative test the urine should be first boiled, to remove dissolved gases, and after cooling introduced with pure yeast into a U-tube, of which the longer arm is sealed, and maintained at a temperature of 35–40° C. A large bubble of gas collects in this arm after two or three hours, even if only 0.05 per cent. of sugar be present. Good quantitative results,

according to the author, may be obtained by a comparison of the reduction and polarizing equivalents, and also of the specific weights of the solution, determined before and after fermentation of the liquid.

Estimation of Sugar by means of Copper Potassium Carbonate Solution. H. Ost. (*Ber. der deutsch. chem. Ges.*, xxiii. 3003-3011; *Journ. Chem. Soc.*, 1890, 1031.) A solution containing 23.5 grams of crystallized copper sulphate, 250 grams of potassium carbonate, and 100 grams of hydrogen potassium carbonate per litre has the following advantages over Fehling's solution for the gravimetric determination of sugars:—

(1) It is unchanged by keeping. (2) Its action on cane-sugar is relatively slight. (3) After ten minutes' boiling, the precipitation of cuprous oxide is practically complete, and thus more concordant results are obtained. (4) The monosaccharoses precipitate almost twice as much cuprous oxide from this solution as from Fehling's solution. (5) The quantity of precipitate obtained from different kinds of sugars varies considerably, thus rendering it possible to determine the composition of mixtures. The solution may be employed for volumetric as well as gravimetric estimations, as the end reaction is sharp; the time required for boiling is, however, longer than with Fehling's solution. For gravimetric determinations, 50 c.c. of the copper solution are mixed with 25 c.c. of the sugar solution, water is added and the liquid boiled for ten minutes, filtered through an asbestos filter, and the cuprous oxide reduced in a current of hydrogen. The table on page 122 shows the quantity of copper precipitated by different sugars.

Estimation of Starch. A. Leclerc. (*Journ. de Pharm. et de Chim.* [5], xxi. 641-645.) Place 2 grams of powdered grain, or 5 grams of straw, hay, faeces, etc. in a 200 c.c. flask, and add 10 c.c. of water, taking care that the substance is thoroughly moistened in every part. To the moistened mass add 180 c.c. of a neutral zinc chloride solution of sp. gr. 1.450, agitate, and heat in a salt-water bath at 108° for 1 to 1½ hours. Cool, transfer to a 250 c.c. flask, and make up this volume by the addition of zinc chloride solution; in the case of fibrous fodder, the volume is made up to 253 c.c., to compensate for the volume of the residue. Filter, and place 25 c.c. of the opalescent filtrate in a 150 c.c. beaker, add 2 c.c. of hydrochloric acid to retain the zinc in solution, and then 75 c.c. of 90 per cent. alcohol, or 62 c.c. of 95 per cent. alcohol. Filter through a tared filter after twenty-four hours. The whole of the dextrin and starch are precipitated; the sugars remain in

Copper.	Invert-sugar.	Dextrose.	Levulose.	Galactose.	Arabinose.
Milligrams.	Milligrams.	Milligrams.	Milligrams.	Milligrams.	Milligrams.
50	15.2	15.6	14.7	17.4	17.0
55	16.6	17.0	16.1	19.1	18.6
60	18.0	18.5	17.5	20.8	20.3
65	19.4	19.9	18.9	22.5	21.9
70	20.8	21.4	20.3	24.2	23.5
75	22.3	22.9	21.7	25.9	25.1
80	23.7	24.4	23.0	27.6	26.7
85	25.2	25.8	24.3	29.3	28.3
90	26.6	27.3	25.7	31.1	29.9
95	28.1	28.8	27.1	32.8	31.5
100	29.5	30.3	28.5	34.5	33.1
105	31.0	31.8	29.8	36.2	34.7
110	32.4	33.3	31.2	38.0	36.3
115	33.9	34.8	32.6	39.7	37.9
120	35.3	36.3	34.0	41.4	39.5
125	36.8	37.8	35.4	43.1	41.1
130	38.2	39.3	36.8	44.8	42.8
135	39.7	40.8	38.2	46.5	44.4
140	41.1	42.3	39.6	48.3	46.0
145	42.6	43.8	41.0	50.0	47.6
150	44.0	45.3	42.5	51.8	49.3
155	45.5	46.8	43.9	53.6	50.9
160	47.0	48.3	45.3	55.4	52.6
165	48.5	49.8	46.7	57.2	54.3
170	50.0	51.4	48.1	59.0	55.9
175	51.5	52.9	49.5	60.8	57.5
180	53.0	54.5	51.0	62.7	59.2
185	54.5	56.0	52.5	64.5	60.9
190	56.0	57.6	54.0	66.4	62.7
195	57.5	59.2	55.5	68.3	64.4
200	59.1	60.8	57.0	70.3	66.2
205	60.7	62.4	58.6	72.3	68.0
210	62.4	64.1	60.2	74.3	69.8
215	64.1	65.8	61.8	76.3	71.6
220	65.8	67.5	63.5	78.3	73.5
225	67.5	69.2	65.2	80.3	75.4
230	69.3	70.9	66.9	82.4	77.3
235	71.1	72.7	68.7	84.5	79.3
240	72.9	74.5	70.6	86.6	81.3
245	74.8	76.4	72.5	88.9	83.4
250	76.7	78.4	74.4	91.2	85.5
255	78.6	80.5	76.5	93.5	87.6
260	80.5	82.8	78.8	95.9	89.8
265	82.5	85.1	81.1	98.3	92.2
270	84.7	87.5	83.5	100.7	94.6
275	87.1	89.9	85.9	103.3	97.1
280	89.7	92.4	88.6	106.1	99.6
285	92.3	94.9	91.3	109.0	102.3
290	95.1	97.6	94.2	112.0	105.1
295	98.0	100.4	97.2	115.1	107.9
298.7	100.0	102.5	99.0	117.0	109.5

solution. The precipitate is washed with a mixture of 1000 c.c. 90 per cent. alcohol and 5 c.c. of hydrochloric acid until it is free from zinc chloride; the acid is then removed by washing with alcohol. Traces of mineral matter taken down by the starch is obtained as ash on burning the starch, and is deducted. A small quantity of nitrogenous matter is also present in the case of grain, which can be determined by estimation of the nitrogen. Working with the quantities given, maize would yield about 1.5 to 2 milligrams of nitrogenous matter in the precipitate from 25 c.c. of solution, oats a little less, and straw not more than 0.5 milligram. The formation of a little dextrin is no inconvenience, as it has the same composition as the starch. The zinc chloride solution is prepared by treating hydrochloric acid with excess of zinc. The decanted solution is decolorized by the addition of a little concentrated potassium permanganate solution, boiled, and treated with zinc oxide as long as the latter dissolves; after cooling and filtering, the solution is ready for use.

Estimation of Formic Acid in the Presence of Acetic and Butyric Acids. A. Scala. (*Gazz. Chim. Ital.*, xx. 393-396.) The liquid to be tested is heated in a deep beaker with a saturated solution of mercuric chloride on a water-bath for two hours, the beaker being kept covered with a clock-glass. Should the acid be present in the free state, it must first be neutralized before proceeding in this manner. At the end of the two hours the precipitated mercurous chloride is collected on a weighed filter, washed with warm water, dried at 100°, and weighed. From the weight of the precipitate, that of the formic acid is readily calculated.

A New Test for Proteïds. J. A. MacWilliam. (*Brit. Med. Journ.*, i. 1891, 837-840.) Salicylsulphonic acid is recommended as a powerful precipitant for proteïds. It precipitates all varieties of these substances; and solutions containing only 1 part of proteïd in 100,000 of water still show an opalescence when treated with a few drops of the reagent. The precipitate produced with albumens and globulins is not soluble on heating, that produced with albumoses and peptones is dissolved, reappearing when the liquid cools. The test is further recommended as a means of detecting minute quantities of proteïd in urine. No normal or other abnormal constituent of the urine is precipitated by the reagent.

Detection and Estimation of Organic and Inorganic Poisons in Corpses. A. Seyda. (*Chem. Zeit.*, xiv. 31-32, 51-53, 128-129, 181-184, and 198-200.) This elaborate essay furnishes a valuable

guide to those engaged in forensic chemical investigations, but since it is impossible to give a useful abstract of it without going to great length, we cannot do more in this place than direct the reader's attention to it, and refer him to the original paper or to a copious abstract of it in the *Journal of the Chemical Society*, January, 1891, 117-123.

Detection of Mercury in Toxicological Investigations. M. T. Lecco. (*Ber. der deutsch. chem. Ges.*, xxiv. 928.) According to the author, the general supposition that in the destruction of organic matter by means of hydrochloric acid and potassium chlorate any mercury present must pass into solution, is erroneous. He finds that it may happen that only traces of the metal thus pass into solution, the bulk of it remaining behind with the insoluble matter. He, therefore, considers it absolutely necessary in this process to prolong the action of the acid and the chlorate for several hours with the application of heat and with frequent stirring.

Detection of Colchicine in Forensic Investigations. N. Obolonski. (*Zeitschr. für analyt. Chem.*, xxix. 493.) The finely divided viscera are rubbed up with glass powder, treated with oxalic acid, and digested for twelve hours with alcohol. The liquid is squeezed out, and the dry residue twice washed with alcohol. The extract is concentrated at a temperature not exceeding 80°, and the cooled residue made up to the original volume with alcohol. The filtered liquid is evaporated as before, and this operation repeated until no clots separate on the addition of alcohol. The residue is then dissolved in water, the solution purified by shaking with light petroleum, and the colchicine finally extracted with chloroform as usual.

The alkaloïd is best identified by means of the violet colour produced by nitric acid; by Erdmann's reagent (nitrosulphuric acid), which gives in succession green, dark blue, violet, and yellow colours, turning to raspberry-red on adding alkali; also by Mandelin's reagent (1 gram of ammonium vanadate in 200 grams of sulphuric acid) which gives a green colour. Colchicine is with difficulty destroyed by putrefaction of animal matter. The kidneys, bladder, and urine are best suited for forensic examination.

Detection of Atropine in Forensic Investigations. F. Ciotto and P. Spica. (*Gazzetta Chim. Ital.*, xx. 619-631.) The author's experiments lead to the following conclusions:—

(1) Vitali's reaction for atropine is only slightly less sensitive

than the mydriatic action, 0.0000002 gram being the smallest amount that can be distinctly detected by the former method; rabbits dosed with slightly less than this amount should be kept under observation for at least half an hour.

(2) The changes which an aqueous solution of atropine undergoes (Flückiger, *Pharm. Chem.*, 1888, 542) are accelerated by exposure to light, and probably by dilution and a moderately high temperature; free atropine is more readily altered than its salts, and the product in any case does not respond to either the chromatic or the physiological test.

(3) In the extracts from two human bodies, obtained by the Stas-Otto method, Vitali's reaction was obtained in the absence of atropine; some ptomaine capable of giving this reaction must therefore exist in putrefied animal remains.

(4) Purification of the extracts, whilst removing a considerable portion of the atropine when present, only partially removes this ptomaine.

Detection of Coniine in a Case of Poisoning. L. W. Andrews. (*Amer. Chem. Journ.*, xiii. 123-128; *Journ. Chem. Soc.*, July, 1891, 871.)

162 grams of the stomach (and contents) were cut up finely, digested for some time with 96 per cent. alcohol and 10 drops of sulphuric acid, filtered, and washed with alcohol. The filtrate and washings were evaporated to one-third at 50°. Light petroleum, benzol, and chloroform, applied successively, failed to extract any alkaloidal substance from this liquid; it was then made alkaline with sodium hydrate and filtered, the precipitate being washed with a little alcohol. A portion of this solution and washing (B) was shaken with light petroleum; on subsequent evaporation with a drop of strong hydrochloric acid, the latter turned red and then violet-blue (a reaction of impure coniine), and a crystalline hydrochloride was left. The following reactions were obtained with this residue:—With phosphomolybdic acid, a pale yellow, amorphous precipitate; with potassio-mercuric iodide, the same; with mercuric iodide a white, amorphous precipitate; with gold chloride a pale yellow, micro-crystalline precipitate; with strong sulphuric acid and potassium dichromate, no colour except from gradual reduction of chromic acid; with picric acid, no change; with platinum tetrachloride, no change; with potassium dichromate, no precipitate; with iodine in potassium iodide solution, a brown precipitate, which disappeared and was reproduced on further addition of the reagent.

One half of the solution B was shaken with chloroform and the rest with ether. The hydrochloride from the former solvent was hypodermically administered to a cat; great dilation of the pupils, violent trembling, laboured and irregular respiration, and partial paralysis of the hind legs were the symptoms that ensued; after a nearly complete torpor had set in, recovery followed in four hours. From the ether solution, microscopic, oily globules smelling of coniine were obtained.

By working up a further portion of the stomach, sufficient of the hydrochloride was obtained for a quantitative determination of the hydrochloric acid, which was found to agree with that calculated from the known formula of coniine hydrochloride.

Detection of Coca Poisoning in Forensic Investigations. U. Mussi. (*Chem. Centr.*, 1890, 516-517.) Since the direct detection of cocaine is difficult, the products of its decomposition should be sought for in toxicological investigations. With this object the author has examined the behaviour of ecgonine with various reagents. According to Einhorn this alkaloid reacts both as a base and an acid; it crystallizes in colourless, lustrous, monoclinic prisms with 1 mol. H_2O , which is lost at $120-130^\circ$. It is very readily soluble in water, less easily in absolute alcohol, insoluble in ether, chloroform, and carbon bisulphide. Its solutions are neutral, and have a somewhat bitter taste. It melts at 198° with partial decomposition. With phosphomolybdic acid it forms a yellow precipitate; with somewhat concentrated gold chloride solution, a yellow, amorphous precipitate; with platinic chloride in dilute alcoholic solution a red-brown, crystalline precipitate, $(\text{C}_9\text{H}_{15}\text{NO}_3)_2, \text{H}_2\text{PtCl}_6$, which is readily soluble in water, and loses hydrogen chloride when heated, forming the salt $(\text{C}_9\text{H}_{15}\text{NO}_3)_2\text{PtCl}_4$. With stannic chloride, mercuric chloride, tannin, and picric acid, it forms no precipitates which distinguish it from cocaine. The test with Wenzell's reagent (200 parts of sulphuric acid and 1 part of potassium permanganate) is very delicate; a clear wine-red coloration is formed, which disappears only after some time.

In an experiment with a rabbit, 1.26 grams of ecgonine per kilo of live weight was found to be fatal. After forty-eight hours the entrails were divided into five parts, each part digested several times at 60° with twice its weight of alcohol, and the extract concentrated nearly to dryness. The residue was taken up with water, and shaken several times with ether in order to extract fatty matter. The aqueous solution was precipitated with basic lead

acetate, filtered, the lead removed as sulphide, the liquid again filtered, evaporated to dryness, and the residue finally extracted with a small quantity of absolute alcohol, which took up the ecgonine as acetate. The alkaloid was thus found in the heart, blood, lungs, liver, brain, and spinal cord.

A New Reaction of Cocaïne. F. da Silva. (*Comptes rendus*, cxi. 348-349.) If a small quantity of cocaïne, or one of its solid salts, or a residue from the evaporation of a solution containing it, be treated with fuming nitric acid, of sp. gr. 1.4, the mixture evaporated to dryness on a water-bath and the residue stirred well with one or two drops of strong alcoholic solution of potash, a distinct and peculiar odour is evolved, recalling that of peppermint. The delicacy of the reaction is stated to be such as to admit of the detection of half a milligram of cocaïne hydrochloride. Of the other bases that can be extracted from an ammoniacal aqueous solution by benzol, atropine, hyoscyamine, strychnine, codeïne, and eserine give colorations when treated in the same way, and eserine also develops a disagreeable odour resembling that of phenylcarbylamine. Delphinine, brucine, and veratrine give only indistinct odours, which cannot be confounded with that from cocaïne. Sabadilline and narcotine can be recognised in the same way, but the other alkaloids give no characteristic reactions.

A New Reaction of Cocaïne Hydrochlorate. E. Schell. (*Pharm. Zeitung*, 1891, 55.) This salt, when mixed with a small quantity of calomel and then moistened with water or simply breathed upon, gives rise to a blackening of the mixture. Atropine is stated to produce a similar effect, but only upon heating. The alkaloid cocaïne does not answer to this test, but only its hydrochlorate.

Reactions of Cocaïne and Ecgonine. D. Vitali. (*L' Orosi*, xiv. 1-19. From *Amer. Journ. Pharm.*) The author proposes the following test for cocaïne. A trace of cocaïne is placed in a porcelain capsule, $\frac{1}{4}$ -1 c.c. of sulphuric acid added, and solution of the alkaloid effected. To this is added iodate of potassium or sodium, or iodic acid in quantity equal to three times that of cocaïne. If this mixture is slightly heated on a water-bath, light green streaks appear; by continuing the heating the liquid becomes grass-green and then dark blue. On increasing the heat the liquid assumes a violet colour, and violet vapours are given off. The reaction is said to be very delicate, as 0.00005 gram can be recognised. Ecgonine does not show this reaction, which seems to

be due to the benzoyl group, as benzoic acid is thus affected with the same intensity as cocaine.

Cocaine appears to be completely decomposed during its passage through the organism. After its internal administration it could not be detected in the urine, which was also found to contain no ecgonine.

The Mercuric Test for Mydriatic Alkaloids. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, xxi. 898.) In reply to some adverse criticism by P. W. and A. H. Squire respecting the value of the mercuric chloride test when applied to hyoscyamine, the author reasserts the correctness of his former statements. The test should be applied in the following manner:—Place about $\frac{1}{10}$ grain of pure hyoscyamine, extracted from a salt by ammonia and chloroform, upon a watch glass or in a test-tube, carefully add 20 minims of 2 per cent. solution of mercuric chloride in proof spirit, watching the change. At first the hyoscyamine becomes pale yellow, then darkens a little, finally on heating a well marked red precipitate is formed.

As regards hyoscine, the author agrees with Messrs. Squire that it yields no mercuric oxide under the above test. This being so, he considers the test an easy means of distinguishing hyoscine from other mydriatic bases.

Tests for the Purity of Antifebrin. E. Ritsert. (*Journ. de Pharm.* [5], xxii. 21–23.) 0.1 gram of the samples is gradually added to 2 c.c. of concentrated hydrochloric acid, and the solution boiled; after cooling and the addition of one or two drops of chlorine-water, the liquid assumes a beautiful blue tint. The aqueous solution of acetanilid should not have an acid reaction; on boiling the solution and adding a few drops of ferric chloride, a deep reddish brown colour should be produced; this disappears on adding a mineral acid. If to a boiling aqueous solution of acetanilid (1 : 30) a drop of potassium permanganate solution (0.1 : 100) is added, the rose colour ought to remain for five minutes at least, and should not become yellow on boiling afresh. When dried for two hours at 105° C. the sample should fuse at 114° C., and should leave no residue on incineration.

Separation of Antifebrin and Phenacetin. H. Will. (*Apoth. Zeitung*, 1890, 652; *Pharm. Journ.*, 3rd series, xxi. 377.) The author found that 1 gram of acetanilid shaken for half-an-hour with 200 c.c. of cold water dissolved completely, and did not separate after standing for a day at the ordinary temperature. On the other hand, when 0.5 gram of phenacetin was shaken for the

same time with 200 c.c. of water only 0.13 gram was dissolved. Upon shaking 1 gram of a mixture of equal parts of acetanilid and phenacetin with 200 c.c. of water the whole of the acetanilid went into solution, with only 0.13 gram of phenacetin, the residual phenacetin, when separated and washed with water, being quite free from acetanilid. In two other experiments in which the proportions of the two compounds were slightly varied, it was found that the weight of the undissolved phenacetin added to 0.13 gram, as the quantity dissolved in 200 c.c. of water, corresponded to the quantity present in the mixture used.

Test for Aldehyde. L. Crismer. (*Zeitschr. für analyt. Chem.*, xxix. 350-351.) Aldehyde and allied bodies produce with Nessler's reagent a yellowish precipitate, which gradually darkens, and can be distinguished from the precipitate caused by ammonia by the addition of potassium cyanide, which dissolves the ammonia precipitate, but turns the aldehyde precipitate black. Treatment with Nessler's test and subsequent distillation is recommended as an efficient process for completely removing aldehyde from commercial ether and chloroform, which always contain this impurity.

Detection of Impurities in Alcohol. E. Mohler. (*Pharm. Journ.*, from *Comptes rendus*, cxi. 187-190.) The author points out that the reagents usually considered the best for detecting impurities in alcohol, viz., sulphuric acid, bisulphite of rosaniline, acetate of aniline and permanganate of potash are only useful within certain limits. He has made experiments with alcohol containing known quantities of the bodies usually found in it as impurities, which show that sulphuric acid cannot be used to estimate the impurities, and is of use only for the detection of such of them as give colorations with it. With bisulphite of rosaniline, the reaction obtained will depend much upon the relative proportion of sulphuric acid and bisulphite of sodium in the reagent employed, even pure alcohol being coloured if only a little acid be used, whilst if both the ingredients are present in too large quantity $\frac{1}{1000}$ part of ethylic aldehyde cannot be detected. He recommends the use of a solution of the following strength: 30 c.c. of a solution of fuchsine of 1 part in 1000; 20 c.c. of a solution of sodium bisulphite (34° B.); sulphuric acid 3 c.c.; distilled water 200 parts. It should be used soon after preparation, and in the proportion of 4 c.c. to 10 c.c. of the alcohol to be tested. This solution does not act on alcohols and ether, but will detect various aldehydes readily. It will not, however, serve for quantitative estimation, the coloration not being proportional to the impurity present.

Acetate of aniline in acid solution is a good reagent for furfural, as it does not react with other alcohols, aldehydes and ethers. As small a quantity as 1 milligram of furfural per litre of alcohol can be detected by this reagent used in proper proportions. With regard to permanganate of potassium in acid solution, it was found to be decomposed by paraldehyde, isobutylic aldehyde and isobutylic alcohol, the reduction being proportional to the amount of aldehyde present. It can be used to distinguish ethylic aldehyde and paraldehyde, of which only the latter instantaneously reduces the permanganate. In the case of the aniline reagents, the full intensity of the coloration is developed in half an hour.

Detection of Alcohol in Commercial Ethyl-Ether. T. Poleck and K. Thümmel. (*Zeitschr. für analyt. Chem.*, Vol. xxix. Part 6; *Chem. News*, April 3rd, 1891.) If a clear mixture of 4.5 vols. of a saturated solution of potassium bicarbonate and 1 vol. of a saturated solution of mercuric chloride is shaken up with commercial ether, the mixture becomes turbid in ten to twenty minutes, and a white amorphous precipitate separates out. If further quantities of ether are added, all the mercury is eliminated except traces, whilst the substance which reacted upon the ether is withdrawn from the mercurial solution. The yellow or brown colour imparted to commercial ether on the addition of potassium hydrate is caused by alcohol.

Volumetric Estimation of Phenols. J. Messinger and G. Vortmann. (*Ber. der deutsch. chem. Ges.*, xxiii. 2753-2756.) A known quantity of the phenol is dissolved in such a quantity of soda solution that at least 4 mols. of soda are present for every 1 mol. of the phenol; the soda should be free from nitrite. The solution is then warmed to about 60°, and decinormal iodine solution added until a strong yellow coloration is produced. If the mixture is now shaken, and warmed, a precipitate is formed. The solution is then cooled, acidified with dilute sulphuric acid, and diluted to 250 or 500 c.c. A measured volume (about 100 c.c.) is filtered off, and the excess of iodine in it determined by titration with decinormal thiosulphate solution. The weight of iodine used in forming the precipitate, multiplied by a certain factor, gives the weight of phenol in the sample examined. The value of the factor is: for phenol, 0.123518; thymol, 0.2956772; β -naphthol, 0.37843106; and for salicylic acid, 0.18132606. In the case of these four phenols fairly accurate results were obtained.

Detection of Resorcin and Thymol. H. Bornträger. (*Amer. Journ. Pharm.*, February, 1891.) Potassium or sodium nitrite,

gypsum and sodium bisulphate in approximately equal quantities are mixed in a test tube and moistened with water, the solution to be tested is then added and heat applied. In the presence of thymol the mixture becomes red in colour; in the presence of resorcin chrome-green, while in the upper part of the tube bright red drops are observed to form. The mixtures ought to maintain their acid reactions. These reactions are very delicate and fairly permanent. Attention is also called to the pleasant fruity odour of the thymol-nitrite.

A New Reaction of Tannin. C. Böttinger. (*Liebig's Annalen*, cclvi. 341-344; *Journ. Chem. Soc.*, 1890, 896.) The author supplies some fuller information respecting the phenylhydrazine test recently described by him. (*Abstract, Year Book of Pharmacy*, 1890, 128.)

When tannin (1 part) is boiled with phenylhydrazine (1 part) in aqueous solution, a mixture of substances is obtained which is soluble in ether and hot water; on the addition of soda to the aqueous solution, phenylhydrazine is liberated, and a beautiful greenish blue coloration is produced. The substance to which the coloration is due can be isolated as follows:—After boiling with phenylhydrazine for four hours, the solution is concentrated, the water decanted, the reddish residue dissolved in hot water, and the solution acidified with hydrochloric acid. A little ammonia is then added, the solution shaken well, decanted from impurities, concentrated by evaporation, extracted with ether, and evaporated to dryness; the residue is then extracted with boiling alcohol, and the solution mixed with ether, whereon phenylhydrazine hydrochloride is precipitated, and the new substance remains in solution. It crystallizes from water in colourless stellate groups, turns yellow on exposure to the air, melts at 112° , decomposes at $130-140^{\circ}$, and is readily soluble in acetic acid, hot water, and alcohol, but only sparingly in ether and cold water; it is only slowly decomposed by concentrated hydrochloric acid. It is readily soluble in phenylhydrazine; if this solution is boiled with acetic acid, an oil is obtained which dissolves in soda with a beautiful greenish blue coloration.

When tannin is boiled with phenylhydrazine and acetic or hydrochloric acid, and the solution then treated with soda, the same greenish blue coloration is produced, but on shaking the solution in a test-tube, reddish yellow streaks are also observed, probably owing to the formation of gallic phenylhydrazide.

Ammoniacal solutions of the tannin-derivative described above

rapidly darken, becoming first light blue, and then violet. In its aqueous solutions, lime-water produces a blue, and baryta-water, a greenish blue precipitate; in boiling solutions, mercuric chloride gives a colourless, silver nitrate a black precipitate. It gives the hydrazide reaction with concentrated sulphuric acid and ferric chloride, and with ferric chloride alone a blue, and then a green coloration is produced, whilst with ammonium carbonate it produces a violet coloration. This compound occurs in the decomposition-products of benzoyl-tannin and phenylhydrazine, and also in the extract of Italian sumach, but it could not be detected in the extract of oak-wood; the phenylhydrazine-derivatives obtained from the oak-extracts have a totally different constitution, and are decomposed by concentrated hydrochloric acid at 120° .

Estimation of Tannin by means of Iodine. A. Moullade. (*Journ. de Pharm. et de Chim.* [5], xxii. 153-159.) The iodine solution is made so as to contain 5.20 grams of iodine and 7.6 grams of potassium iodide per litre; this is standardised by means of a freshly prepared solution of pure and dry tannin, 1 to 1000 of water; a 10 per cent. solution of sodium bicarbonate is also required. 10 c.c. of tannin solution, about 20 c.c. of the sodium carbonate solution, 10 c.c. of water, and 2 to 3 c.c. of carbon bisulphide are placed in a flask, and iodine solution is run in until it begins to impart a violet or rose tint to the bisulphide. If 10.5 c.c. of iodine has been used, a second assay is made, in which 10 c.c. is run in at once; if this be not sufficient, a third assay is made, running in 10.3 c.c., and if this gives the colour, a fourth experiment with 10.2 c.c. is made. Should the latter produce no coloration, it would follow that 10.3 c.c. of the solution of iodine correspond to 10 c.c. of the tannin solution. Astringent substances to be assayed are treated in the same way, and their contents in astringent acids can be expressed in terms of pure tannin. Solutions in that case should not contain more than 1.5 grams of tannin per litre. To 10 c.c. of the solution, 30 c.c. of the sodium carbonate solution are added, the 10 c.c. in excess being employed to largely saturate the astringent acids present, and the titration is conducted directly without filtration. To ascertain the real amount of tannin in a solution, the assay is repeated on another portion from which the tannin has been removed by treatment with hide. The method is said to be applicable to all astringent substances, even to wine. In the case of the latter, all interfering compounds are practically eliminated as follows:—The assay is first made on 10 c.c. of the wine; then 50 c.c. of the wine are mixed with 50 c.c. of

a solution of gelatin (1 : 1000), and 20 c.c. of the filtrate are taken for a new assay. The difference between the volumes of iodine required in the two cases indicates the amount of tannin in the wine.

Estimation of Tannin in Tea. P. Maltzscheffsky. (*Journ. de Pharm. et de Chim.* [5], xxii. 270-271.) The tannin is precipitated by means of normal copper acetate, and the excess of copper is titrated by the aid of potassium ferrocyanide solution. The copper solution contains 7.657 grams of copper oxide per litre (1 c.c. = 0.01 tannin), and its strength is verified by evaporating a measured volume to dryness, moistening the residue with nitric acid, heating to redness, and weighing the oxide. The ferrocyanide solution is prepared by making up 100 c.c. of a saturated solution to one litre. To standardise this solution, it is added, 1 c.c. at a time, to 5 c.c. of the copper solution diluted to 100 c.c., until a drop of the mixed liquids gives a blue colour with a solution of ferric chloride (1 : 100). A second assay, in which the additions of ferrocyanide solution are made by tenths of a c.c. towards the end, gives the exact strength of the solution. 2 grams of tea dried at 100-107° are extracted four successive times with 100 c.c. of boiling water; the filtrates are united, made up to 400 c.c.; 100 c.c. of this solution is boiled and treated with 10 c.c. of copper solution. The precipitate is collected on a filter, washed with hot water, and the filtrate and washings are made up to 200 c.c.; half of this is taken, and the excess of copper is determined approximately by means of the ferrocyanide solution; the second half of the solution then serves for the exact determination of the copper. In 14 samples, the amount of tannin varied from 6.10 to 11.08 per cent. The water varied from 5.59 to 12.48 per cent.; the ash from 3.14 to 9.25; the aqueous extract from 17.3 to 39.4; and the caffeine from 1.00 to 2.88 per cent.

The Estimation of Caffeine (Theine) in Tea. B. H. Paul. (*Pharm. Journ.*, 3rd series, xxi. 882.) The author's results show that notwithstanding the greater solubility of caffeine in chloroform, it is not possible to substitute this solvent for alcohol in determining the amount of caffeine in tea. It is therefore easy to account for the small amounts of caffeine reported by some analysts to have been found in tea when chloroform has been used for its extraction.

In discussing the question why chloroform fails to dissolve out the whole of the caffeine from mixtures of tea with lime and magnesia, the author states that similar results were obtained when operating upon mixtures of pure caffeine with lime or

magnesia. In one experiment a mixture of 0.25 gram of dry caffeine with 1 gram of lime, wetted and then dried, was subjected to the action of boiling chloroform in a percolator. The chloroform solution gave on evaporation 0.182, showing a deficiency of 27.2 per cent. of the quantity taken, and that was afterwards extracted by treatment with boiling alcohol. In another experiment with 0.258 gram of dry caffeine and 1 gram of magnesia the caffeine obtained was 0.256 gram, or only 0.8 per cent. short of the amount taken. It appears, therefore, that lime has a peculiar capability of retaining some of the caffeine, when chloroform is used as the extracting menstruum, and the results obtained in these experiments also serve to account for the fact that in extracting with chloroform, more caffeine is obtained from a mixture of tea with magnesia than from a mixture of tea with lime.

Amount of Theine in Tea. B. H. Paul and A. J. Cownley. (*Pharm. Journ.*, 3rd series, xxi. 61.) The authors have made a further series of analyses of different kinds of tea for the purpose of obtaining additional evidence as to the amount of theine. It will be seen from the following table that the conclusion previously arrived at by them as to the presence of theine in greater proportion than had been assumed is fully sustained.

Tea.	Price.	Moisture. p. c.	Theine.	
			Original Tea p. c.	Dry Tea. p. c.
	Retail			
29.	2s. 4d.	7.60	3.54	3.88
30.	2s.	6.75	3.66	3.93
31.	1s. 6d.	6.20	3.12	3.32
32.	1s. 6d.	6.60	3.06	3.27
33.	1s. 4d.	5.40	3.42	3.61
34.	1s. 8d.	8.00	2.82	3.06
35.	1s. 4d.	6.60	2.74	2.93
36.	1s. 6d.	7.40	2.92	3.15
37. Ceylon dust	—	8.00	3.58	3.89
	Broker.			
38. China	1s. 3d.	8.60	3.46	3.78
39. "	11½d.	8.40	3.32	3.63
40. "	7d.	8.60	3.20	3.50
41. "	4½d.	8.98	2.20	2.42
42. Japan Congou . . .	7d.	6.42	2.74	2.98
43. " "	5½d.	6.28	2.72	2.90
44. " "	5d.	7.64	2.58	2.79
45. " "	4½d.	6.92	2.42	2.60
46. Java Pekoe Flowery .	1s. 7½d.	7.34	3.16	3.41
47. " "	1s. 2d.	7.92	3.78	4.10
48. " " S'chong .	11d.	7.04	2.94	3.16

The samples in this table are numbered consecutively with those previously analysed. Further proof is afforded by the present numbers that the amount of theine in tea does not stand in any constant or definite proportion to the price of the article. The prices given in these instances are the market prices, to which the amount of duty chargeable has to be added as well as the retailer's profit to make them comparable with the prices given for the other samples of tea purchased retail at grocers' shops.

Estimation of Alumina in Bread. W. C. Young. (*Analyst*, xv. 61-63; 83-84.) In Dupré's process, the aluminium is precipitated as phosphate from an acid solution containing ammonium chloride and acetate, and is collected after remaining all night in the cold. Test analyses, with weighed quantities of alum, show that under these conditions the results are much below the truth. The best result (from a mixture of alum, sodium phosphate, and acetic acid) was obtained by boiling the mixture both before and after the addition of ammonium acetate, and filtering immediately. The amount of ammonium acetate must not be too small, nor that of acetic acid too large. For 0.1 gram of potash alum, 1 gram of ammonium acetate and 5 c.c. of ordinary acetic acid are suitable proportions. The presence of ammonium chloride has little effect when the liquid is filtered immediately after boiling, but lowers the result if the precipitation is performed in the cold, or if the mixture is allowed to cool before filtering.

Detection of Mineral Acids in Vinegar. M. Balzer. (*Répertoire de Pharm.*, October, 1890.) The author uses for this purpose a very weak aqueous solution of methylaniline violet. A few drops of the vinegar to be tested are poured upon a plate where it is agitated with a glass rod previously dipped in the methylaniline solution. If mineral acids are present the violet coloration disappears and is replaced by a well-marked tint of blue or green. Sulphuric and hydrochloric acids give the green shades; nitric acid produces a blue coloration.

Honey. O. Haenle. (*Pharm. Zeitung*, July, 1890). The author has critically examined the tests for the purity of honey, and arrives at the following conclusions:—(1) That a honey which after having been dialysed rotates polarized light to the right is adulterated with starch syrup; (2) That a honey which after having been dialysed does not rotate polarized light to the right is free from this adulteration.

Detection of Adulteration in Lard. E. Dieterich. (*Helpfenberger Annalen*.) The author remarks that the melting point of pure lard, as given by the last German Pharmacopœia, viz., between 36° and 42° C., can be relied upon as a criterion only when the method by which it is determined is stated, since the same fat will show different melting points according to the method used. He determines the melting point by enclosing the fat in a glass tube open at both ends, which is immersed (vertically) in water. The temperature at which the fat rises in the tube is taken as the melting point.

According to the author the melting point of lard prepared by himself varied between 40° and 43° C.; of lard bought in the market, 38° and 44° C. Hübl's iodine number, in the case of the former, was between 51 and 58.9; in the latter between 50.7 and 62.9. Its determination affords valuable indications as to the absence or presence of foreign fats.

The author has examined the various processes recommended in recent times for the detection of cotton-seed oil in lard, but does not find any of them reliable. Special attention is called to the fact that Becchi's silver test and Labiche's acetate of lead reaction, although valuable when applied to lard adulterated with unheated cotton-seed oil, fail to give any reaction if the cotton-seed oil has, previous to its admixture with the lard, been heated to a temperature at which it emits fumes for one or two minutes.

Estimation of Acid Potassium Tartrate, Free Tartaric Acid, Malic Acid, and Mineral Salts in Wine. M. Schneider. (*Chem. Centr.*, 1890, ii. 277-279. The author considers that the acid potassium tartrate in wine is completely precipitated by concentration and treatment with alcohol, but that the precipitate is accompanied by other salts, such as phosphates, etc. The precipitate thus separated must, therefore, be incinerated, and the carbonic anhydride in the ash determined; from this the amount of the tartrate may be readily calculated.

The following method is recommended:—100 c.c. of wine are evaporated, with the addition of sand, to a thin syrup, which is transferred to a flask, and treated with sufficient alcohol of 96 per cent. to make up the volume of the liquid to 200 c.c.; the flask is then closed and allowed to remain for twelve hours in a cool place. The solution is filtered, and the insoluble portion washed with alcohol until the washings are neutral. The filter with its contents is returned to the flask and digested with hot water, the aqueous solution filtered, and exactly neutralized with

decinormal alkali: it is then evaporated to dryness and the residue incinerated. The carbonic anhydride in the latter is equivalent to half the quantity of acid potassium tartrate in the wine. The alcoholic filtrate is freed from alcohol by evaporation, and mixed with a strong solution of potassium acetate acidified with acetic acid. The mixture is then evaporated with sand, treated with 96 per cent. alcohol (200 c.c.), and the amount of acid tartrate determined as above. The carbonic anhydride contained in this ash is equivalent to the free tartaric acid present in the wine.

For the estimation of the malic acid, 100 c.c. of the wine are exactly neutralized with decinormal alkali, evaporated to dryness, incinerated, and the carbonic anhydride estimated. From this, is deducted the quantity equivalent to the tartaric acid and acid potassium tartrate; the remainder corresponds to the malic acid. The author considers that the acids and bases are combined in wine in the following manner:—The potassium is present as acid potassium tartrate; the sodium as chloride; calcium as sulphate and acid phosphate; magnesium as phosphate; and iron as phosphate.

Replying to a criticism of Niederhäuser on the above method of determining malic acid in wine, the author contends that the amounts of tannin and succinic acid are rarely worth noticing, but that in applying the method described in the foregoing abstract, the amount of carbonic anhydride which corresponds with the volatile acids should be deducted.

Detection of Paraffin in Beeswax. H. Hager. (*Zeitschr. für analyt. Chem.*, xxix. 480–481.) A few grams of the substance in fine, air-dried shavings, are gradually heated in a small porcelain capsule, until fumes begin to rise. A wide-mouthed bottle of $\frac{1}{2}$ litre capacity is then inverted upon the capsule, and when filled with white vapours is closed and set aside until the fumes have condensed upon its sides. The sublimate is then dissolved in 3 c.c. of chloroform, the chloroform evaporated in a test-tube, and the residue boiled with 4 c.c. of soda solution. If paraffin was present, it will after cooling be found floating on the clear solution. A drop of the chloroform solution may also be evaporated on a slip of glass and examined microscopically.

The fumes from pure beeswax are not as white as those of paraffin, and are only obtained at a higher temperature (300–320°). The sublimate gives a coloured solution with chloroform, and a coloured and turbid solution with soda. The residue from the chloroform

solution is a dull film; paraffin on the contrary gives separate particles in a clear field.

Test for Glycerine. C. A. Kohn. (*Journ. Soc. Chem. Ind.*, ix. 148.) Advantage is taken of two characteristic reactions:—(1) the formation of acraldehyde by the distillation of glycerine with acid potassium sulphate; (2) the red coloration produced by acraldehyde in a solution of rosaniline decolorised by sulphurous anhydride. The delicacy of the reaction is found to be such that it is possible to detect 0·015 gram of glycerine. The reaction is not shared by any of the following substances:—Manitol, cane-, grape-, or milk-sugar, starch, dextrin, albumen, gelatin, stearic acid, and oleic acid. The carbohydrates interfere with the delicacy of the test, owing to the fact that their distillation products with acid potassium sulphate hinder the formation of the red colour with rosaniline solution.

Purity of Glycerine. H. Will. (*Apotheker Zeitung*, October 4, 1890, 612.) The German Pharmacopœia requires that the addition of three drops of silver nitrate solution to a mixture of 1 c.c. of glycerine boiled with 1 c.c. of ammonia solution, should not cause any coloration or precipitation. In consequence of a good deal of adverse criticism of this test, the author has made it the subject of a series of experiments, and finds that the test will answer very well, provided certain precautions are observed. He recommends that the mixture be only heated in boiling water or in an air-bath until bubbles of ammonia gas appear, by which means overheating is avoided, and that the test-tube be removed from the bath immediately after the addition of silver nitrate, since the same sample of glycerine gives different results according to the length of time it is exposed to the action of the ammoniacal silver oxide solution at a high temperature.

The Purity of Glycerine. B. Jaffé. (*Chemiker Zeitung*, 1890, 1493). The test for the purity of glycerine given in the German Pharmacopœia (see preceding abstract), has given rise to much dissatisfaction. It was found that very few samples would stand the test if the latter be performed at the actual boiling point as directed, while, on the other hand, most samples would answer the requirements of the test if the heat applied be limited to the temperature of the water-bath. The author shows that the reaction varies very much according to the amount of ammonia used. With a large excess of ammonia *all* samples of glycerine will fail to show any reduction, while if an excess of glycerine be used, *all* samples will reduce ammoniacal silver nitrate; as long

as by the presence of a sufficient quantity of ammonia the boiling point of the mixture be kept sufficiently low, no reduction will take place. If, by boiling, a portion of the ammonia be volatilized, the boiling point rises, finally reaching such a temperature at which reduction will take place under all conditions. In the presence of a sufficient excess of ammonia, formic acid, arsenious acid and aldehyde will also fail to reduce silver nitrate.

Estimation of the Anhydrous Glycerine in Commercial Glycerine. N. E. and C. Deiss. (*Chemist and Druggist*, December 20, 1890.) To 10 grammes of the glycerine mixed with 6 grammes of liquefied carbolic acid, an aqueous solution of carbolic acid (50 grammes per litre) is gradually added from a burette until at 11° C. turbidity occurs. Anhydrous glycerine takes up 28.15 c.c. of the carbolic solution, and every 0.39 c.c. less of the solution required is equivalent to 1 per cent. deficiency in the glycerine.

Estimation of Glycerine in Soap. L. J. Spencer. (*Chemist and Druggist*, March 28, 1891. From *Pharm. Record*.) Take 5 grammes of the soap, dissolve in hot water, decompose with dilute sulphuric acid, allow to stand for half an hour, then separate the isolated fatty acids by filtration and wash the filter with a little water, neutralize the filtrate with barium carbonate and filter; wash the filter with a little water and evaporate the filtrate on a water-bath at 100° C. to a syrupy consistence. This residue consists of the glycerine and certain organic or colouring matters. The glycerine is extracted with a mixture, 1 part of ether and 3 parts of 95 per cent. alcohol, and the solution filtered. The filter is washed with a little of the same solvent, the filtrate evaporated on a water-bath and the extraction repeated twice more. After evaporating to a constant weight, the glycerine is placed in a desiccator, and weighed. A good qualitative test for glycerine is to treat the substance to be tested with a little pyrogalllic acid and a few drops of dilute sulphuric acid, and then to boil, when the mixture will turn red. If now a little stannous chloride be added, a beautiful violet-red is produced.

Determination of the Fatty Acids in Soap. M. Saupe. (*Pharm. Centralhalle*, xxxi. 314-315.) The author's process is a slight modification of that employed by Liebermann and Wolff. 2 grams of the finely cut up soap are dissolved in a separating cylinder in 50 c.c. of water; 5 c.c. of hydrochloric acid are then added, and the free fatty acid is extracted with 54 c.c. of ether saturated with water. After separation, 20 c.c. of the ether are evaporated in a beaker, and the residual fatty acids weighed.

Simple Method for the Detection of Petroleum in Oil of Turpentine. S. J. Hinsdale. (*Chem. News*, vol. 63, 161.) Place ten drops of the oil to be examined in a (moderately concave) watch-glass, and float the glass on about a quart of water having a temperature of about 170° F. If the oil is pure, it will evaporate and leave the glass quite dry within seven minutes. If the oil contains even 5 per cent of petroleum, it will not have completely evaporated in that time.

The specific gravity of pure oil of turpentine is about 0.865.

Detection of Resin Oil in Oil of Turpentine. E. Baudin. (*Journ. de Pharm. et de Chim.* [5], xxiii. 279-280). A drop of the suspected oil is placed on a thin slip of unsized paper, and allowed to evaporate spontaneously. After one or two hours, the liquid has disappeared without leaving a sensible stain if pure, but if adulterated with resin oil, a distinct oily stain is left. 5 per cent. of impurity may thus be easily detected. In doubtful cases, 20 to 30 drops are evaporated to 6 or 8 drops in a porcelain capsule, and this concentrated solution is tested as above. By comparison with known mixtures, an approximate estimation of the amount of impurity present may be made.

Detection of Traces of Hydrogen Peroxide. T. Fairley. (*Chemist and Druggist*, December 13, 1890.) To 5 c.c. of a 0.005 per cent. solution of H_2O_2 in a test-tube, add 1 to 2 c.c. of ether, and then a small drop of chromic acid by means of a small, pointed glass rod dipped in a 10 per cent. solution of the acid. Shake up, and allow the ether to separate, when the blue colour due to the solution of the perchromic acid in ether is distinctly visible, especially against a white ground. If necessary, the yellow aqueous liquid should be screened from the eye by means of a sheet of paper held so as to leave the ether alone visible.

Potassium Iodate as a Standard for Iodometry, Acidimetry, and Alkalimetry. M. Gröger. (*Zeit. ang. Chem.*, 1890, 385-386; *Journ. Chem. Soc.*, 1891, 614.) The facility with which pure potassium iodate is prepared renders it an admirable basis for iodometric analysis. Sublimed iodine is dissolved in hot, pure, moderately strong potash as long as it does not colour the solution. The liquid is evaporated to dryness, and the residue exhausted with alcohol. The undissolved portion is repeatedly crystallized with hot water, until it no longer affects sensitive litmus paper, or gives a blue colour with sulphuric acid and starch. The alcoholic solution is used for the preparation of potassium iodide; for this purpose it is evaporated to dryness, the residue dissolved in water,

and sufficient iodine added to produce a deep coloration; hydrogen sulphide is then passed through the liquid, the filtered solution evaporated, and the iodide crystallized until pure. A permanent iodine solution for standardising hyposulphite may be made by dissolving the accurately weighed iodine in an excess of pure potash, and diluting to a known volume. The solution can be preserved unchanged, and the iodine liberated at any time by adding excess of acid.

Protection of Solution of Litmus from Change. W. Duncan. (*Pharm. Journ.*, 3rd series, xxi. 594.) The author has made some experiments with various antiseptics with a view to discover some simple means of overcoming the deterioration to which this solution is liable. This object is most satisfactorily attained by substituting chloroform water for distilled water in making the solution. The use of chloroform water secures a permanent solution of litmus and does not in any way interfere with its use as an indicator.

Source of Error in the Estimation of Sulphuric Acid. E. v. Meyer. (*Journ. Prakt. Chem.* [2], xlii. 270.) Attention is directed by the author to the observation that during the evaporation of large quantities of liquids, an appreciable amount of sulphuric acid may be absorbed from the gases given off in the combustion of the coal-gas used for heating. A notable error may thus be introduced into sulphuric acid estimations performed under such conditions. One litre of pure distilled water evaporated down to 50 c.c. in a platinum basin over a small Bunsen flame during twenty-four hours, showed an absorption of sulphuric acid corresponding to 0.0106 gram of sulphuric anhydride.

Estimation of Alkalies in Presence of Sulphites. J. Grant and J. B. Cohen. (*Journ. Soc. Chem. Ind.*, ix. 19-20.) A measured volume of hydrogen peroxide is run into a beaker, together with three or four drops of methyl-orange. As hydrogen peroxide is always slightly acid, a small quantity of a very dilute solution of sodium hydrate (1 : 100) is added by means of a 1 c.c. pipette until the neutral point is reached. The requisite quantity of alkaline sulphite solution is next added, and boiled up at once, but gently. During the latter part of the boiling, the methyl-orange is bleached. The solution is cooled, a few more drops of methyl-orange added, and the solution titrated with normal hydrochloric acid. From a series of experiments, the authors conclude, (1) that the quantity of ordinary 10 per cent. hydrogen peroxide required depends on the percentage of sulphite present in the alkaline solution. The

"caustic salts" of commerce contain about 50 per cent. of sulphite, hence it is sufficient to take 10 c.c. of commercial hydrogen peroxide for every 0.1 gram of the "salts" solution, although this gives twice the theoretical quantity of oxygen required to oxidise the sulphite to sulphate. For salts containing above 50 per cent. of sulphite, it is better to take double the volume of hydrogen peroxide. (2) It is unnecessary to leave the mixture of alkaline sulphite solution and hydrogen peroxide for half an hour before boiling up, seeing that the increase in quantity of acid required for neutralization is almost inappreciable.

Effect of Temperature on Nessler's Test. A. Hazen and H. W. Clark. (*Amer. Chem. Journ.*, xii. 425-426.) The authors find that the colour produced in the Nessler test varies with the temperature, and deepens according to the rise of the latter. It is thus necessary to bring the distillate and the standard ammonia solution to the same temperature before comparing the tints which they give with the Nessler solution.

Assay of Sodium Nitrate. O. Foerster. (*Chem. Zeit.*, xiv. 509-510.) About 3 grams of the nitrate dried at 150°C . are evaporated three successive times, each time with 25 c.c. of hydrochloric acid of 18 to 20 per cent. strength. The resulting chloride is dried at 150°C ., then gently ignited and weighed, and the nitrate calculated from the difference. The method can only be depended upon in the absence of other substances, which would be attacked by hydrochloric acid.

Estimation of Nitrates. G. McGowan. *Proc. Chem. Soc.*, No. 97). The author describes a method of estimating nitrates based on the interaction $\text{HNO}_3 + 3\text{HCl} = \text{NOCl} + \text{Cl}_2 + 2\text{H}_2\text{O}$. The nitrate is warmed together with an excess of concentrated hydrochloric acid in an apparatus from which air has been expelled by CO_2 , and the gaseous products are led into a solution of potassium iodide; an amount of iodine is liberated equivalent to the whole of the chlorine carried forward, nitric oxide escaping, *i.e.*, $\text{HNO}_3 = 3\text{Cl}$.

Colorimetric Estimation of Nitrates in Water. G. Loeff. (*Pharm. Journ.*, 3rd series, xxi. 558.) A few centigrams of sodium salicylate are dissolved in 5 c.c. of water, and 10 c.c. of pure sulphuric acid cautiously added by pouring down the side of the vessel. Mixture is then effected by shaking, when a red coloration indicates the presence of 0.02 per cent. N_2O_5 , and a light yellow colour a percentage of 0.002. By comparison with a standardised potas-

sium nitrate solution the percentage of nitric acid can be estimated with tolerable accuracy.

Estimation of Nitric and Nitrous Acids in Potable Waters. M. Rosenfeld. (*Zeitschr. für analyt. Chem.*, xxix. 661-664; *Journ. Chem. Soc.*, April, 1891, 496.) Under certain conditions, the reaction of nitric and nitrous acids with pyrogallol affords one of the most sensitive means for their detection and approximate estimation. 3 c.c. of the water to be tested are rapidly mixed in a conical test glass with 6 c.c. of concentrated sulphuric acid, one drop of a 1 per cent. solution of pyrogallol is then added, and cautiously mixed with the upper two-thirds of the liquid. In a few minutes, or immediately, according to the amount of nitric acid present, a dark brown to violet colour is produced. As little as 1 milligram of nitric anhydride per litre can be detected, and up to 15 milligrams per litre, comparisons of the depth of colour with standards furnish a roughly approximate estimation. The test-glass for the operation must not be wiped, and not more than one drop of the pyrogallol solution should be used, unless the colour disappears on shaking, which may happen when much nitrate is present.

For nitrous acid, a solution is made containing 0.5 gram of pyrogallol, 90 c.c. of water, and 10 c.c. of sulphuric acid. Of this mixture, 2 c.c. are added to 100 c.c. of the water in a cylinder. 0.04 milligram of nitrous anhydride in the 100 c.c. produces a yellow colour immediately; with 0.01 milligram, the colour develops only in the course of about seven hours. Up to 0.05 milligram, a difference of 0.005 milligram is perceptible.

A Rapid Method of Estimating Nitrates in Potable Waters. G. Harrow. (*Proc. Chem. Soc.*, No. 96.) The method depends on the reduction of nitric to nitrous acid by means of zinc-dust and hydrochloric acid, in a very dilute solution, in presence of α -naphthylamine and sulphuric acid, the estimation being made by comparing the depth of the pink azo-coloration developed in the solution with that arising on similar treatment of standard nitrate solutions. A beaker containing 50 c.c. of the water is placed on a sheet of white paper side by side with other beakers holding 50 c.c. of standard solutions containing 1.0, 0.1 and 0.01 of nitrogen as nitrate per 100,000, and to each is added 10 c.c. of a test solution, prepared by dissolving 1 gram of α -naphthylamine, 1 gram of sulphanilic acid and 25 c.c. of hydrochloric acid in about 200 c.c. of water, boiling with a small quantity of animal charcoal, filtering and making up to 500 c.c. A very small quantity of zinc-dust—7 to 8 milligrams—is added to each beaker. If nitrate be present

in the water, a more or less intense pink colour is developed, which may be compared, at the end of fifteen minutes, with that arising in the standard solutions. By diluting the water until the tint produced is judged to be of the same intensity as that of one of the standards—preferably the most dilute—a first approximation is arrived at; and the water, having been diluted to the extent indicated by the results, a fresh experiment is made with this diluted water. When nitrites are present, the amount is estimated in a similar manner prior to the addition of zinc-dust, and due allowance is subsequently made. The author quotes a considerable number of comparisons with the Crum method, which show that very satisfactory results are obtainable.

Comparison of the Methods in Use for Estimating Organic Nitrogen. R. W. Oddy and J. B. Cohen. (*Journ. Soc. Chem. Ind.*, ix. 17.) The methods compared were those of Kjeldahl, Wanklyn, and Dumas, colourless isinglass being selected as a typical albuminoid substance. The percentages of nitrogen obtained in five determinations by Dumas' method varied from 15.2 to 15.7 per cent., from which it may be assumed that 15.2 is nearest to the truth, as the results of this method are known to be slightly too high rather than too low. Wanklyn's process yielded a quantity of ammonia equivalent to 10.5 per cent. of nitrogen, which is much too low. Kjeldahl's process gave the following percentages of nitrogen:—With pure sulphuric acid, 13.5; with commercial sulphuric acid, 14.1 to 14.25, and with another sample of the commercial acid, 15.2 to 15.8. The mean of these results is decidedly too low. The authors are of opinion, that although this process is very satisfactory in the case of the more readily decomposed organic compounds, the results have a tendency to be too low in the case of substances decomposing less easily.

Estimation of Free and Combined Carbonic Acid in Mineral Waters. H. Bretet. (*Journ. de Pharm. et de Chim.* [5], xxiii. 339–341.) To 50 c.c. of the mineral water two or three drops of phenolphthaleïn are added, and standard potash solution is added slowly until a persistent rose tint is obtained. The quantity of free carbonic anhydride is double the equivalent of the potash used. Standard potassium carbonate solution can also be employed, and with advantage, as its solution is more stable than that of the hydrate; in this case, one equivalent of the carbonate is the measure of the free carbonic anhydride.

Two or three assays should be made, and the mean result, omitting the first one, should be taken. The amount of solution re-

quired by the first assay is added at once in the second assay, and is always too little; more is now added, with gentle stirring, so as to avoid all possible loss of free gas. The total carbonic anhydride is now estimated by adding standard sulphuric acid to the solutions just obtained until a slight excess is present, the solution being boiled to expel the free anhydride, and the excess of acid titrated back with standard potash.

Estimation of the Total Nitrogen in Manures. E. Aubin and J. Quenot. (*Bull. de la Soc. Chim.* [3], iii. 322-326.) The authors have obtained accurate results by means of the following process, in which use is made of the fact that tannic acid precipitates the albumen contained in the manure, and thus renders the organic nitrogen insoluble:—1 gram of the manure is placed on a small filter, and is exhausted with 30-40 c.c. of a 2 per cent. tannin solution. The nitrogen contained in the residue is estimated by Kjeldahl's method, and is the organic nitrogen, whilst the filtrate similarly treated gives that existing as ammonium salts; the nitrogen present as nitric acid being determined by Schloesing's method. In the case of manures containing ammonium-magnesium phosphate, 1 gram of manure should be digested with 0.5 gram of tannin in 150 c.c. of carbonic acid water for fifteen hours; the residue and filtrate are to be treated as above described.

Estimation of Iodides. F. A. Gooch and P. E. Browning. (*Amer. Journ. Sc.* [3], xxxix. 188-201.) The method proposed consists in boiling the solution of the iodide with sulphuric and arsenic acids; the iodide is oxidised by the latter, and arsenious acid is formed, together with free iodine, which volatilizes with the steam. The arsenious acid in the residual solution is titrated with standard iodine. There must be at least 25 per cent. by volume of strong sulphuric acid in the solution when the boiling is finished. The presence of considerable quantities of chlorides makes the result too low, owing to volatilization of arsenious chloride; bromides are slightly oxidised by arsenic acid, and consequently make the result too high.

Detection of Chlorides, Bromides and Iodides. G. Denigès. (*Bull. de la Soc. Chim.* [3], iv. 481-483.) The solution is strongly acidified with sulphuric acid and heated with ferric chloride, when the liberated iodine may be recognised by starch paper. After the iodine has been expelled by boiling, potassium chromate is added in order to liberate the bromine, which is recognised by introduc-

ing a rod moistened with solution of sodium hydrate into the vapour and then dipping it into aniline water, when the hypobromide formed will produce an orange-yellow coloration. After removing every trace of iodine and bromine by continuous boiling of the acid liquid with excess of potassium chromate, potassium permanganate is added to the boiling mixture in order to liberate the chlorine, which is identified by repeating the same test which was employed for the detection of bromine, the aniline water in this case acquiring a violet coloration.

Direct Estimation of Chlorine in Mixtures of Alkaline Chlorides and Iodides. F. A. Gooch and F. W. Mar. (*Amer. Journ. Sc.* [3], xxxix. 293-302. From *Journ. Chem. Soc.*) The authors have shown, in a great number of experiments, that hydrochloric acid is stable under the conditions of the methods described below. No significant loss of chlorine by volatilization or otherwise took place in the following cases, selected from the numerous examples given in the paper :—

(1) When a solution containing 10 c.c. of sulphuric acid (1 to 1), and 1 gram of potassium chloride is concentrated from 400 c.c. to 300 c.c. by boiling for about half an hour.

(2) Or when a solution containing 10 c.c. of sulphuric acid (1 to 1), 5 grams of iron-alum, and 5 c.c. of nitric acid, sp. gr. 1.40, is treated with 0.5 gram of potassium chloride in a similar manner.

(3) Or when a solution containing 10 c.c. of sulphuric acid (1 to 1), 2 grams of ferric sulphate, 5 c.c. of nitric acid, about 0.5 gram of potassium chloride, and 1 gram of potassium iodide. Or when nitrous fumes were substituted for the ferric sulphate.

On the other hand, iodine is fully expelled from hydriodic acid in the presence either of nitrous acid or ferric sulphate. It was found that without some agent to regenerate the ferrous sulphate produced in the reaction, an equilibrium was established before all the iodine was expelled, and the nitric acid was added for this purpose. The methods suggested are as follows :—

10 c.c. of sulphuric acid (1 to 1), 2 grams of ferric sulphate (either as iron-alum or ferrous sulphate oxidised in concentrated solution by about 0.3 c.c. of nitric acid), and 3 c.c. of nitric acid are added to the solution of the alkaline iodide and chloride, diluted to 400 c.c., and the whole boiled until the steam ceases to colour red litmus paper greyish blue, a reaction found by the authors to be characteristic for iodine and very delicate; the chlorine is then determined in the residue. In the second method, the iodine is expelled by passing in the gases evolved from 2 grams

of sodium nitrite by the action of dilute sulphuric acid. A trap is used to prevent mechanical loss of liquid during boiling.

Direct Estimation of Bromine in Mixtures of Alkaline Bromides and Iodides. F. A. Gooch and J. R. Ensign. (*Amer. Journ. Sc.* [3], xl. 145-152.) The neutral solution of the bromide and iodide, containing not more than .5 gram of each, is diluted to about 700 c.c. in a flask, and then mixed with $2\frac{1}{2}$ c.c. of a mixture of equal volumes of sulphuric acid and water; an excess of pure potassium nitrite is now added, and the mixture boiled for at least half an hour or until the escaping steam is free from iodine. The residual liquid is treated with an excess of silver nitrite, and the precipitated bromide collected, dried, and weighed. The presence of not more than .5 gram of the chloride does not affect the accuracy of the process.

Qualitative Analysis of a Mixture of Iodides, Bromides, and Chlorides. F. A. Gooch and F. T. Brooks. (*Amer. Journ. Sc.* [3], xl. 283-290.) A few drops of a solution of pure potassium nitrite (free from chlorine) are added to the solution under examination previously acidified with dilute sulphuric acid. A yellow coloration produced by the nitrite indicates the presence of an iodide. Should the quantity of this constituent be so small as to escape observation in this way, it may be readily detected by shaking the mixture with a little carbon bisulphide, or by heating it and testing the escaping fumes with red litmus paper, which is coloured greyish blue by the liberated iodine. If iodine be present, it must be completely removed by boiling the liquid with a sufficient quantity of nitrite and dilute sulphuric acid until the vapour ceases to act on the test paper. After this a portion of the solution is tested for bromide by adding a drop or two of sodium hypochloride solution, and shaking with carbon bisulphide. For the detection of chloride another portion of the solution freed from iodides is evaporated to dryness, and the residue heated with potassium bichromate and sulphuric acid in the usual way, when, in the presence of chloride, the fumes after condensation will form a coloured liquid producing with ammonia a yellow solution of ammonium chromate, which can be further tested with acetic acid and lead acetate.

Qualitative Analysis of the Barium Group. C. Lüdeking. (*Zeitschr. für analyt. Chem.*, xxix. 556-561.) The presence of a large proportion of calcium chloride in the solution under examination greatly interferes with the detection of barium and strontium by means of calcium sulphate. In a similar manner, the presence

of much strontium chloride considerably diminishes the sensitiveness of the calcium sulphate test for barium. On the other hand, a very strong solution of strontium chloride may produce an almost instantaneous precipitate with a solution of calcium sulphate, just as if barium were present. The author therefore prefers to conduct the analysis of the acetic acid solution of the ammonium carbonate precipitate in the following manner:—The solution is boiled with a saturated solution of potassium chromate, to detect and remove any barium. Strontium and calcium should then be again precipitated from the filtrate by ammonium carbonate, and the precipitate, after being well washed, dissolved in hydrochloric acid and tested for strontium by the spectroscope. The strontium is then precipitated by boiling with an excess of sulphuric acid, and the filtrate tested for calcium.

Quantitative Separation of Barium and Strontium. R. Fresenius. (*Zeitschr. für analyt. Chem.*, xxix. 143–160, and 413–430; *Journ. Chem. Soc.*, 1890, 924.) This is a continuation of the report abstracted in the *Year-Book of Pharmacy*, 1890, 110. Dealing with the separation of the two metals by means of hydrofluosilicic acid, the author points out certain sources of error, which may be obviated by working as follows:—The solution containing the barium and strontium is mixed with excess of hydrofluosilicic acid, stirred, and allowed to remain for thirty minutes, after which alcohol (4 vols. to 10 vols. of the solution) is added, and the mixture again allowed to repose for two hours. The precipitate is first washed with dilute alcohol (1:1), and then several times with small quantities of cold water. The aqueous washings are concentrated to a small bulk, mixed with a few drops of hydrofluosilicic acid and $\frac{1}{3}$ volume of alcohol, and the small precipitate obtained filtered off after two hours. The filtrates are all united, and the strontium precipitated by sulphuric acid and alcohol.

All attempts to obtain complete separation of barium and strontium by means of chromic acid in a single precipitation resulted in failures. The author finds, however, that by double precipitation, a complete separation can be effected even when the proportion of strontium is large. The solution of the chlorides is feebly acidified with acetic acid, and diluted until it contains not more than 0.5 per cent. of the bases, then precipitated hot with an excess of ammonium chromate, which has been carefully neutralised with ammonia. After cooling for an hour, the precipitate is washed by decantation with very dilute ammonium chromate until the washings no longer give a precipitate with ammonium carbo-

nate, and then further with warm water until the washings are scarcely coloured by silver nitrate. The precipitate is then dissolved in the smallest possible quantity of nitric acid, and the solution again diluted and heated. Ammonium acetate is added in sufficient quantity to displace the free nitric acid by acetic acid, and then ammonium chromate until the odour of acetic acid has completely disappeared. After an hour, the liquid is poured through a filter, the precipitate is digested with hot water, cooled, filtered, and washed thoroughly with cold water. It is then free from strontium, whilst the filtrates contain no barium. Double precipitation from neutral or alkaline solutions has not been successful.

Separation of Barium from Calcium. R. Fresenius. (*Zeitschr. für analyt. Chem.*, xxx. 18-23.) Precipitation by normal ammonium chromate from a dilute, hot solution of the two chlorides, feebly acidified with acetic acid, filtration after cooling, and washing, first with ammonium chromate and then with warm water, gave a fairly satisfactory result, the baryta found being 0.3127 gram, instead of 0.3104. A little calcium was therefore retained by the precipitate, and this was also the case when more acetic acid was used (2 c.c. to 200 c.c. of solution containing 0.5 gram of the bases), together with 6 grams of ammonium acetate, and the precipitate was most thoroughly washed by digesting with hot water, and filtering after cooling. By double precipitation, a slight deficiency of barium and a trifling excess of calcium were obtained; the separation was, however, more nearly perfect. The first precipitate was dissolved in a little nitric acid, and the diluted solution precipitated by ammonium acetate and chromate.

Precipitation with hydrofluosilicic acid and washing with dilute alcohol did not give complete separation, a little calcium being precipitated. A more satisfactory, but still not quite perfect, separation resulted when the precipitate, after slight washing with weak alcohol, was repeatedly digested with cold water, the aqueous washings concentrated, reprecipitated with 4 drops of hydrofluosilicic acid and one-third volume of alcohol, and the small precipitate added to the main one.

Volumetric Estimation of Chromates, Barium Salts, and Sulphates. P. Soltsien. (*Pharm. Zeitung*, xxxv. 372). The titration of solutions of barium salts with potassium bichromate, and inversely the titration of chromates with barium salts, may be readily performed with either hæmatoxylin or logwood extract as indicator. A solution of barium chloride is prepared equal to one

of potassium bichromate, and for the determination of barium salts, potassium bichromate is run in from the burette until a drop placed on a warmed porcelain plate with a drop of hæmatoxylin just shows the formation of a blue-black coloration. The solution to be titrated must be neutral, and may not contain more than the merest trace of either acetic acid or ammonia. Chlorides and nitrates do not interfere with the reaction, nor does rosolic acid, which latter may be used as an indicator for the titration of solutions of salts of barium. If the solution of a chromate contains sulphates, the titration with barium chloride gives the total quantity of the two salts, from which must be deducted the amount of the latter as determined gravimetrically.

For the determination of the combined sulphuric acid, an excess of barium chloride solution is added, and the excess determined by titration with potassium dichromate.

Salts of aluminium, copper, and iron must be removed from the solutions.

Assay of Ferric Hypophosphite. F. X. Moerk. (*Amer. Journ. Pharm.*, June, 1891.) 0.2 grams of finely powdered ferric hypophosphite, 1.0 gram of citric acid, and 25 cc. of water are placed in a beaker and stirred for several minutes until the acid dissolves; then ammonia water is added slowly until the liquid smells strongly of it (this has for its object the decomposition of the ferric hypophosphite, the ferric hydrate entering largely into solution through the agency of the ammonium citrate present); after allowing to stand for ten minutes with frequent stirring to completely decompose the iron salt, 75 c.c. of a cold saturated solution of mercuric chloride are added, and then hydrochloric acid, drop by drop, stirring constantly until an almost colourless solution results and the calomel commences to precipitate. Allow to stand for half an hour and then place for a further half-hour in a water-bath at 100° C. Collect the precipitate upon a weighed filter, wash with boiling water, dry at 100° C., and weigh. The weight of the calomel multiplied by .088934 gives the weight of the ferric hypophosphite. With the same sample, after the details were ascertained, the following percentage figures were obtained: 97.56, 97.73 and 97.73.

It appears that the alkaline citrate prevents the hypophosphorous acid from exerting any reducing action upon the ferric salt in the time necessary for making the assay; the important part to be observed is to first allow the greater part of the reduction to take place in the cold, and then to finish by application of heat. The

filtrate should always be tested by heating to the boiling point, to see if the reduction is complete.

Detection of Silver in Solutions containing Mercurous Salts. F. X. Moerk. (*Chemist and Druggist*, January 3, 1891.) The author calls attention to the fact that as much as 1 per cent. of silver nitrate present along with mercurous nitrate, on precipitation with hydrochloric acid and treatment with ammonia, does not give a perceptible precipitate after acidifying the ammonia solution with nitric acid. A 1 per cent. silver nitrate solution alone gives a copious precipitate. The probable cause of the failure is that the precipitated mercurous chloride surrounds the precipitated silver chloride and prevents the solvent action of the ammonia.

Volumetric Estimation of Manganese. G. Vortmann. (*Ber. der deutsch. chem. Ges.*, xxiii. 2801-2803.) The author's process is based on the ready oxidation of manganous salts by iodine in the presence of an alkali. One part of the manganous salt is dissolved in water together with 2-3 parts of potassium alum, and treated with excess of normal iodine solution and pure sodium hydrate; after warming for 5-10 minutes on the water-bath, the solution is cooled, diluted to a known volume, an aliquot part filtered, acidified, and the excess of iodine determined with solution of sodium hyposulphite. The process was found to give very satisfactory results.

Volumetric Estimation of Zinc. E. Donath and G. Hattensaur. (*Chem. Zeitung*, xiv. 323-325.) The authors' method is based on the observation that potassium ferrocyanide precipitates zinc but not iron in the presence of tartaric acid and ammonia, and that the excess of either of these substances does not seriously disturb the relative proportion of 1 mol. of ferrocyanide to 2 atoms of zinc engaged in this reaction. Hence 1 c.c. of a solution containing 33.5 grams of potassium ferrocyanide per litre corresponds with 0.010 gram of zinc. As small an excess of ammonia as possible, and a hot solution, are favourable to the precipitation. The zinc precipitate is not decomposed by acetic acid; therefore, by placing drops of this acid and the solution under examination in contact, in the presence of iron, a coloration indicates complete precipitation of the zinc. The *modus operandi* is as follows:—3 to 4 grams of material are dissolved in hydrochloric acid with some nitric acid, diluted to a definite volume with water, an aliquot part filtered, treated with 20-25 c.c. of concentrated tartaric acid solution, a slight excess of ammonia added, and the liquid warmed to about 80°. The ferrocyanide is now added from a burette until the pre-

precipitation of the zinc is complete, as indicated in the manner described above. The proportion of iron to zinc in the solution under examination should be the same as that present in the solution used for standardising the ferrocyanide.

Volumetric Estimation of Zinc. L. Blum. (*Zeit. anal. Chem.*, xxix. 271-272.) The author points out that the process recently recommended by Donath and Hattensaur for the volumetric estimation of zinc (preceding abstract), is useless in the presence of manganese, the results in that case being too high.

Estimation of Arsenic by Marsh's Method. B. Kühn and F. Saeger. (*Ber. der deutsch. chem. Ges.*, xxiii. 1798-1803, from *Journ. Chem. Soc.*) About 150 grams of pure zinc (sufficient for the decomposition of about 0.11 gram of arsenious acid) is placed in an Erlenmeyer flask, which is also provided with an india-rubber stopper through which pass a funnel 50 cm. long, reaching to the bottom of the flask, and a delivery-tube bent at right angles. The latter is connected to a wash-bottle containing 50 cc. of a 5 per cent. lead acetate solution, this to a drying-tube containing at least 100 grams of calcium chloride, and this, finally, to the shorter drawn-out end of the combustion-tube. The latter is made of hard glass tubing of 10-12 mm. internal diameter; 80 cm. of it lie in a combustion-furnace, heated by 24 burners, and it is drawn out at both ends to a tube of about 5 mm. internal diameter for a length of 25 cm. at one end and 60 cm. at the other. Over the funnel, above mentioned, are two burettes: one containing the arsenic solution, the other dilute sulphuric acid (1 part by vol. of acid [sp. gr. 1.84] to 3 of water). The combustion-tube is heated to a dull-red heat, and sulphuric acid run into the flask, so as to sweep out the apparatus with a current of hydrogen. The acid is then arranged so as to drop in at about $\frac{3}{4}$ cc. per minute, 25 cc. of the arsenic solution is run in at about $\frac{1}{2}$ cc. per minute, and the shorter, contracted limb of the combustion-tube is heated at three separate places with Bunsen burners; if any arsenic is deposited here, it is a sign that the current of hydrogen is too slow. The current must not be so fast that the bubbles in the lead acetate bottle cannot be counted, and in order to see that no arsenic has escaped, a wash-bottle containing a little silver nitrate should be connected with the further end of the combustion tube. The arsenic is deposited as a mirror in the longer limb of the combustion-tube; it is brought as much as possible into one part of this by warming it, and sending a reversed current of hydrogen through if necessary. The piece of tubing is cut off, weighed, the arsenic dissolved in strong nitric

acid, and the tube weighed again. Or if, as may happen in toxicological cases, it is desired to preserve the arsenic, the little piece of tubing should be placed inside a larger piece, drawn out at one end, and the arsenic sublimed into this end in a current of hydrogen. More than 0.1 gram of arsenic cannot be easily estimated, and, in any case, the results are not very exact, but the method is expeditious, and, for some purposes, may be useful.

It has also been found that, contrary to the statement of the text-books, arseniuretted hydrogen is decomposed to a considerable extent when it is passed over solid caustic potash, though not so easily as antimoniuiretted hydrogen.

Bettendorf's Reagent for Arsenic. H. Warnecke. (*Pharm. Zeitung*, 1891, 167.) The author finds Bettendorf's test to be one of the most useful general tests for arsenic, and directly applicable to almost every chemical. He prepares the reagent by dissolving one part of crystallized stannous chloride in two parts of concentrated hydrochloric acid of 1.20 specific gravity. About 1 gram or 1 cc. of the substance or solution to be tested is dissolved in 5 cc. of the reagent; a brown precipitate or coloration within fifteen minutes indicates the presence of arsenic. In the case of bismuth subnitrate and solution of ferric chloride, the testing should be performed in this way in the cold; in all other cases heating to the boiling point will bring about immediate reduction of the arsenic impurity to the metallic condition, producing the brown colour or precipitate.

Copper in Cereals. W. Johnstone. (*Chemist and Druggist*, November 22, 1890.) The author states that the occasional existence of copper in cereals, peas, beans, etc., as a natural constituent, is well known. Out of a large number of samples of wheat and barley he himself tested, 15 per cent. were found to be more or less contaminated with that metal. As few soils in this country contain copper to any appreciable extent, the author is inclined to attribute the presence of copper in Scotch barley and English wheat to the prevalent practice of dressing the grain and also the ground with sulphate of copper, so as to protect it from the ravages of vermin after the grain is sown.

MATERIA MEDICA AND PHARMACY.

PART II.

MATERIA MEDICA AND PHARMACY.

Japanese Aconite, called Kusu-Uzu. A. Lubbe. (*Amer. Journ. Pharm.*, August, 1890.) The author has examined these tubers, the botanical origin of which has not been satisfactorily established. The crystallized alkaloid, purified by repeated recrystallization, was found to be free from bitter taste, to melt at about 184°C ., and not to give any characteristic colour reaction. It is identical with aconitine, and has the formula $\text{C}_{33}\text{H}_{44}\text{NO}_{12}$. The hydro-bromide and chloride yield again the same base unaltered. Physiological experiments made with this alkaloid also showed its identity with that obtained from *Ac. Napellus*. It was observed that it passes, to some extent, into the saliva unaltered. The presence of pseudaconitine could not be established; but, besides the crystalline aconitine, at least two amorphous bases, having a bitter taste, were recognised.

Japanese Aconite, called Shirakawa-Bushi. O. Lezius. (*Amer. Journ. Pharm.*, August, 1890.) The author examined these tubers, which agreed in appearance and structure with the drug described by Langgaard under the name of *Shirakawa-uzu*. In Japan the parent tubers of aconite are usually distinguished as *uzu*, from the secondary tubers, which are designated *bushi*. The tubers examined are, therefore, most likely mainly these latter tubers, presumably of *Aconitum chinense*. Besides two amorphous bases, which were not further examined, 0.02 per cent. of crystallized alkaloid was isolated in the pure state and chiefly used for physiological investigations, which were identical in their results with those produced by aconitine from *Ac. Napellus*. The identity of these two alkaloids was corroborated by the acid, not bitter taste; by the melting point (180.9°C .); by the absence of colour reactions; by the rhombic plates of the hydriodide, etc. The small yield of aconitine is attributed to the fact that the tubers had been preserved by salting them.

The Rhizome of Male Fern (*Aspidium Filix-mas*). J. B. Nagelvoort. (*Chemist and Druggist*, October 18, 1890. From *Pharm. Post*.) The author gives some interesting figures relating to the filicic acid and oleo-resin strength of this rhizome collected at different periods. The following are his results:—

	Per cent. filicic acid.	Per. cent. oleo-resin.
December, 1888	0.29	6.0
" " " " " " " " " " " "	0.35	8.5
July, 1889 " " " " " " " " " " " "	0.23	5.6
September, 1889	0.65	6.2
October " " " " " " " " " " " "	0.24	5.7
February, 1890	0.23	8.0
" " " " " " " " " " " "	0.4	13.0
" " " " " " " " " " " "	0.3	11.0
April " " " " " " " " " " " "	0.22	6.0
" " " " " " " " " " " "	0.28	5.7
" " " " " " " " " " " "	0.26	6.0

Glycyrrhiza Lepidota. M. L. McCullough. (*Amer. Journ. Pharm.*, August, 1890.) The older and more fully developed portions of the rhizome were selected for preparing glycyrrhizin, and parallel experiments were made with officinal liquorice root. The powder of the American drug was the lighter in colour. The powder was exhausted with ammoniated water, the solution precipitated with sulphuric acid, the precipitate washed with cold water, dissolved in ammonia and again precipitated; this process was repeated for the third time, when the precipitate was dissolved in ammonia and the solution poured upon glass to scale. The ammoniated glycyrrhizin from the American plant had a somewhat bitter after-taste. Equal weights of both products were then dissolved in ammonia, the glycyrrhizin precipitated by acid, and washed with cold water. By this operation the loss in weight of the product from the official drug was 21.87 per cent., and from the American plant 25 per cent. Comparing the results we have from—

G. glabra, ammoniated glycyrrhizin 9.2 per cent., crude glycyrrhizin 7.18 per cent.

G. lepidota, ammoniated glycyrrhizin 8.53 per cent., crude glycyrrhizin 6.39 per cent.

Washing the crude glycyrrhizin with diluted alcohol caused a loss in the former of 43 per cent., and in the latter of 50 per cent. of the weight. The latter also lost some of its colour and sweet taste.

Aletris Farinosa. (*Journ. de Méd.*, September 7, 1890.) The rhizome is administered in the form of a powder, in doses of 0·6 gram, as a simple bitter tonic. In larger doses, it possesses cathartic, emetic and somewhat narcotic properties. It has been employed with good results in colic, dropsy and chronic rheumatism.

Sweet Pellitory. D. Hooper. (*Pharm. Journ.*, 3rd series, xxi. 143.) A Persian drug is annually imported into Bombay in the spring under the names of *Bozidan* (Persian) and *Mitha-akkalkara* (Bombay.) *Bozidan* is also applied to *Caucalis orientalis*, the *βορσαϊδαν* of the later Greek physicians, and *Mitha-akkalkara* signifies "sweet pellitory," *akkalkara* being the Indian term for the root of pellitory of Spain as sold in the bazaars. Dr. Dymock has examined some freshly imported parcels of the root, and from some specimens of the flowers and fruit he has identified the plant to be *Tanacetum umbelliferum*. The native doctors consider it to be aphrodisiac, tonic, deobstruent, useful in rheumatism and gout, and in enlargement of the liver and spleen. They also regard it as having abortifacient and anthelmintic properties.

The root has some resemblance to pellitory, but it is larger and paler in colour. It is rough and furrowed longitudinally; internally it is hard and whitish, and breaks with a tough, close fracture. The microscopic structure also resembles that of pellitory root. The corky layer is made of thick-walled cells, and oil cells occur in the middle layer of the bark and in the medullary rays. Some of the parenchymatous cells were loaded with granular matter, which however did not show the sphaeroidal character of inulin when the root had been immersed for four months in alcohol.

The root was sweetish and mawkish to the taste, with a very slight degree of acidity, and the odour was like chaulmoogra oil, especially when powdered or boiled with water. A proximate analysis of the powdered root separated ether extract 1·0, alcoholic extract 8·6, water extract 25·1, crude fibre 56·9, and 6·8 of ash in one hundred parts. The ether extract, having the peculiar odour of the drug, was evaporated to dryness and digested in rectified spirit for several months; this separated a whitish insoluble granular fatty substance, and a light reddish brown liquid. The insoluble portion examined under a microscope was seen to consist of radiating crystalline tufts of wax, tasteless, and neutral in reaction. It dissolved in petroleum ether, and to some extent in boiling alcohol, solidifying in the cold. It softened a little above 70° C., at the temperature of boiling water melted to

a brown liquid, and with sufficient heat it burnt away on platinum foil with a smoky flame. The soluble portion of the ether extract was evaporated; the residue was acid in reaction, and produced a numbing sensation on the tongue, and at the same time caused a copious flow of saliva. This fatty residue was treated with petroleum ether, which dissolved some fatty acid, and left a brown resin. The latter had the properties of pyrethrin. Besides its action on the tongue, it was soluble in proof spirit, ether, chloroform and bisulphide of carbon; insoluble in ammonia, caustic and alkaline carbonates, and but slightly soluble in cold petroleum ether. It dissolved in nitric acid with evolution of gas, and in sulphuric acid with a reddish brown colour and evolving the odour of butyric acid.

The alcoholic extract contained an organic acid in addition to some saccharine matter reducing Fehling's solution, and no trace of an alkaloid. A solution of the organic acid was darkened in colour by ferric salts, gave an orange precipitate with plumbic acetate, and caused no deposit in gelatin solution. The water extract contained 15 per cent. of a carbohydrate precipitated in a pulverulent form with three volumes of alcohol.

The author considers that sweet pellitory is so-named not so much on account of the amount of sugar it contains, as owing to the small amount of the acid and pungent principle.

Note on Phlox Carolina. H. G. Greenish. (*Pharm. Journ.*, 3rd series, xxi. 839.) The author reports upon a drug offered to him as spigelia, which differed however from the root of *Spigelia marilandica* in its straighter, thicker and less wiry rootlets and smoother rhizome, from which the characteristic cup-shaped scars of the genuine drug were absent. Moreover the cortex of the root showed a decided disposition to separate from the woody column, leaving the latter as a continuous yellow thread. These characters led the author to suspect that he was dealing with *Phlox carolina*, the root of which has been substituted for that of *Spigelia marilandica* in the United States. This supposition was confirmed by a comparison of the drug with a specimen of the root of *Phlox carolina* obtained by the author from Professor Maisch. The microscopic examination disclosed the following features:—

The transverse section of a light coloured, well-developed root shows a small central woody column enclosed within an endodermis and surrounded by a comparatively large cortex. In the latter portion of the section the eye is at once arrested by numerous

stone-cells, and also by the presence in a number of cells of an apparently granular mass, more or less completely filling them. Here and there a small fragment of red colouring matter (? phloxol) is visible.

A tangential section shows the stone cells to be of remarkable length. It also discloses the nature of the granular masses; they are large and well-formed cystoliths. These are usually more or less cylindrical in shape, not acutely pointed, as is sometimes the case.

On treating a section with dilute hydrochloric acid, the calcium carbonate of which they are principally composed dissolves with effervescence, leaving the cellulose skeleton undissolved. The presence of the stone-cells and cystoliths are the most characteristic features of the section.

Neither of them are confined to the root, but are to be found as well in the parenchymatous tissue of the rhizome and aerial stem. Here the cystolith, varying in shape with the cell which it occupies, is frequently nearly cubical, whilst the stone cells assume approximately similar dimensions.

It was observed that some roots appeared light coloured, whilst others were dark, both externally and internally, suggesting the possibility of the sample consisting of the mixed roots of two or more species of *Phlox*.

On examining the roots of his samples one by one, in search of an explanation of this difference, and separating the pale from the dark, the author found a root which had, at some period or other of its growth, been injured: the cortex had been cut through, whilst the woody column remained intact. Above the injury the root was pale, below it nearly black; thus proving the identity of the dark root beyond doubt. Further search showed that every case of injury to the cortex was accompanied by the presence in the neighbouring tissue of an abnormal amount of colouring matter, and several portions of root were found, which were dark at one end and pale at the other.

The Presence of an Alkaloidal Constituent in Valerian Root. M. Waliszewski. (*L'Union Pharm.*, March 15, 1891; *Répertoire de Pharm.*, April 10, 1891.) The author has found this drug to contain an alkaloidal principle which he proposes to name *chatinine*, in honour of M. Chatin. In order to obtain it, the volatile products are removed from the root by distillation, after which it is extracted with boiling water, and treated with acetate of lead. The filtrate is freed from lead by sulphuric acid or

sulphuretted hydrogen, and evaporated to the consistence of a soft extract, which is then exhausted by alcohol of 90 per cent. The alcoholic solution is distilled, the residue dissolved in distilled water, this solution evaporated to the consistence of an extract, and treated with sodium bicarbonate and ether, after which the ether is washed with distilled water. The liquid is now evaporated, and the residue, which is chatinine, treated with hydrochloric acid. As valerian root contains an ammoniacal salt, which remains with the chatinine during the above operations, the product must be treated with 95 per cent. alcohol, in which the chloride of ammonium remains insoluble. The chatinine salts have the general characters of the alkaloids, and, like them, are precipitated by picric acid, bichloride of platinum, Valser's reagent, tannin, Bouchardat's reagent, etc.

Constituents of Calumba Root. M. Bocchiola. (*Chemist and Druggist*, January 10, 1891.) The author's analysis of the cortical and woody portions of calumba root shows the following percentages:—

—	Outer part.	Inner part.
Water	13.00	14.00
Ash	5.00	6.00
Ether extract	0.70	0.80
Alcohol extract	3.89	3.86
Proof-spirit extract	17.96	17.80
Calumbine	1.42	1.90
Calumbine, by titration	0.98	1.38
Berberine	1.43	0.72
Berberine, by titration.	2.95	1.45

The percentage composition of the ash was:—

Silicic acid.	14.13	7.42
Phosphoric acid, as an iron salt	6.11	1.61
Phosphoric acid, combined with alkali and earthy bases.	5.04	12.63

An analysis of an older root brought out the interesting fact that it contained more of the active principles than the young root. Thus it contained 2.07 and 2.63 per cent. of calumbine, and 2.05 and 1.02 per cent. of berberine. It will be seen from the above that the calumbine occurs in greater quantity in the inner part, but the reverse is the case as regards berberine.

Heuchera Americana. J. C. Peacock. (*Amer. Journ. Pharm.*, April, 1891.) The root of this plant was found by the author to have the following composition:—

	Per cent. amount.
Fat, wax and caoutchouc	65
Gallic acid (trace) and resin	56
Tannin (5.55 per cent.), glucose (3 per cent.) and phlobaphene	20.72
Glucose (6.09 per cent.), saccharose (3.17 per cent.), mucilage and tannin (.26 per cent.)	9.84
Albuminoids (1.5 per cent.) and extractive soluble in dilute alkalis	3.50
Calcium oxalate (1.2 per cent.) and extrac- tive soluble in dil. hydrochloric acid	4.85
Starch	4.67
Moisture	8.08
Ash	6.14
Cellulose, lignin and loss	40.99
Total	100.00

Constituents of the Roots of *Sanguinaria Canadensis*. G. König. (*Chem. Centr.*, 1891, i. 321–322.) The roots of *Sanguinaria canadensis*, a native of North America, contain four alkaloids, viz., *chelerythrine*, $C_{21}H_{17}NO_4 + C_2H_6O$, *sanguinarine*, $C_{20}H_{15}NO_4$, γ -*homochelidonine*, $C_{22}H_{21}NO_4$, and *protopine*, $C_{20}H_{17}NO_5$, all of which also occur in the sanguinarine of commerce. Chelerythrine is identical with the alkaloid which the author separated from *Chelidonium majus*, while γ -homochelidonine is probably identical with the base isolated by Selle from *Chelidonium majus*. As to *protopine* there is a perfect identity between specimens of this base prepared from *Sanguinaria canadensis*, *Chelidonium majus* and opium.

Constituents of the Root of *Bryonia Dioica*. A. Mankowsky. (*Pharm. Journ.*, 3rd series, xxi. 496.) The author states that of the two glucosides contained in *Bryonia alba*, bryonin and bryonidin, the former is entirely without action, while the latter is poisonous only in large doses. The substances hitherto known as bryonin, and regarded as the active agent of *radix bryoniae*, are simply more or less purified extracts of the root, and probably contain both glucosides. The bryonin of Schwerdtfeger is a mixture of the two glucosides with other substances, while Walz's bryonin is probably a mixture of this glucoside with bryonidin in smaller quantities. Introduced into the stomach, bryonidin causes inflammation of the stomach and larger intestines; introduced

into the veins, only slight inflammation of the latter. The pancreatic juice decomposes bryonidin, and renders it inoperative. It has no effect on the peristaltic action of the intestines, nor on the activity of the heart, nor on the peripheral nerves; introduced into living organs it causes an enlargement of the vessels.

Constituents of *Stachys Tuberifera*. A. v. Planta. (*Ber. der deutsch. chem. Ges.*, xxiii. 1699-1700.) In addition to stachyose, various nitrogenous compounds occur in the tubercles of *Stachys tuberifera*. Of these, glutamine and tyrosine have been identified, and a base has also been obtained which is precipitated by phosphotungstic acid, and forms a hydrochloride and aurochloride somewhat resembling those of betaine. Its exact nature has not yet been determined.

Assay of *Ipecacuanha* Root. E. M. Arndt. (*Apoth. Zeit.*, 1890, 781.) 10 grams of the powdered ipecacuanha are intimately mixed with 5 grams of sodium carbonate and 1 gram of crystallized ferric chloride, the mixture digested for one hour with 100 grams of 60 per cent. methyl alcohol in a water-bath with inverted condenser; it is then filtered and evaporated to remove the alcohol (at this stage the choline or its decomposition products are volatilized), the residue taken up with 50 c.c. of very dilute solution of ammonia, and this mixture agitated with 25 c.c. of chloroform. The chloroform solution is agitated with slightly acidulated water, and the resulting aqueous solution titrated with Mayer's reagent (each c.c. corresponds to 0.0198 gram of emetine): 5 to 5.5 c.c. of the reagent should be necessary for the completion of the reaction, indicating an alkaloidal strength of at least 0.945 per cent. of emetine.

Constituents of the Californian Soap Plant, *Chlorogalum Pomeridianum*. H. Trimble. (*Amer. Journ. Pharm.*, December, 1890.) The bulbs were freed from the husk-like outer scales, until the white fleshy interior was reached, and this inner portion was cut into small pieces, and in this condition used in the following analysis.

The moisture, by drying to constant weight at 110° C., was found to be 73.13 per cent. and the ash 0.70 per cent. No unusual constituents were found in the ash.

Stronger ether extracted 0.13 per cent. from the moist drug. The extract was reddish brown, crystalline, and of a peculiar odour. The crystals were soluble in water, and removed from it by agitation with ether. They gave negative reactions for alkaloids, but by the peculiar odour developed on heating with HCl

and the presence of glucose, a glucoside was indicated. That part of the extract insoluble in water was red, resinous and soluble in alcohol.

The residue, after extraction with ether, yielded 4.49 per cent. to absolute alcohol. This extract was dark brown, nearly black, of an odour resembling chocolate, and largely soluble in water, forming a reddish, neutral, frothy liquid, which gave no reaction with ferric chloride.

Water extracted from the remainder 9.35 per cent., consisting of 0.07 per cent. of dextrin, 1.45 per cent. of glucose, 0.45 per cent. of saccharose and 1.20 per cent. of mucilage. The solution was yellow, turbid, frothy, neutral and possessed an acrid taste. The residue after treatment with dilute alkali and acid amounted to 4.13 per cent., representing cellulose and lignin.

A special determination of saponin showed there were 1.87 per cent. of this substance present, to which aqueous infusions of the bulbs owe their tendency to froth.

The Astringent Principle of *Geranium Maculatum*. H. Trimble and J. C. Peacock. (*Amer. Journ. Pharm.*, June, 1891.) Unlike several other investigators, the authors find the rhizome of this plant to be free from gallic acid. The astringent principle in the fresh rhizome is solely tannin agreeing in its characters with gallotannic acid. This tannin amounts to 3.2 to 6.7 per cent. in the fresh, and to 9.7 to 27.8 per cent. in the absolutely dry drug. It is associated with a reddish brown colouring matter for which the name *geranium red* is suggested.

Presence of an Alkaloid in *Tylophora Asthmatica*. D. Hooper. (*Pharm. Journ.*, 3rd series, xxi. 617.) The specific name of this Indian plant points to its medicinal activity as being an important character, although other plants in the same natural order have somewhat similar properties. The older botanical names of the plant, *Asclepias vomitoria*, *Cynanchum vomitorium*, and *C. Ipecacuanha*, refer more exactly to the physiological action of the drug, and as the action resembles so closely that of the true ipecacuanha of Brazil, it has been recommended in medical practice as a substitute in India, Mauritius, and other countries where it grows.

The roots are pale brown, very brittle, and about 6 inches or more in length by half a line in diameter. They have a sweetish taste, followed by acidity. The odour of the freshly dried root is suggestive of old brown Windsor soap.

The alkaloid is dissolved out of the inspissated alcoholic extract

with water, and the filtered solution, rendered alkaline with ammonia (which causes a precipitate of the base), yields it up to ether on agitation with that liquid. It is only sparingly soluble in water, but freely so in ether and alcohol, imparting to the latter an alkaline reaction. It is crystallizable and forms crystalline salts with hydrochloric and nitric acids. The pure alkaloid added to a few drops of sulphuric acid is dissolved with a reddish brown colour which changes to a red, then to green and finally to an indigo tint. With nitric acid the alkaloid is coloured purplish red; the acid itself assuming an orange colour. Hydrochloric acid forms with it a yellowish solution. Frohde's reagent dissolves it with a sap-green coloration. Sulphuric acid and bichromate of potassium form a violet-brown fluid. A solution discharges the colour of permanganate of potassium, but is not affected by ferric chloride and lead acetate. The purplish colour with nitric acid is similar to that obtained with buxine and pereririne, but the absence of a strong bitterness, and the different purposes to which the respective mother plants are put, do not admit of a chemical relation between these bases.

The author proposes for this alkaloid the name *tylophorinc*.

Anagallis Arvensis. A. Schneegans. (*Journ. Pharm. von Els.-Lothr.*, 1891, 171; *Amer. Journ. Pharm.*, July, 1891.) *Anagallis arvensis*, used in Mexico instead of saponaria, has been found by the author to contain two glucosides identical with those obtained from quillaia and senega.

The aqueous decoction is precipitated with neutral lead acetate: the precipitate, thoroughly washed with water containing lead acetate, is suspended in water and decomposed by dilute sulphuric acid, the excess of the acid neutralized by lead carbonate, the mixture filtered, the filtrate evaporated to dryness, the residue dissolved in boiling absolute alcohol, four volumes of chloroform added, the precipitate removed and the filtrate mixed with ether until precipitation ceases; this precipitate, dried over sulphuric acid, corresponds with quillaic and polygalic acid. It is soluble in water, dilute alcohol and boiling absolute alcohol; the aqueous solution has an acid reaction, foams strongly and reduces Fehling's solution after boiling with dilute acids; it has a sharp, acrid taste.

The filtrate from the lead acetate precipitate is precipitated with basic acetate of lead and the precipitate purified as above, avoiding, however, the use of chloroform: by repeatedly dissolving in hot alcohol and precipitating with ether, and drying over sulphuric

acid, a yellowish powder was obtained identical with sapotoxin and senegin. It is easily soluble in water and dilute alcohol, also in hot absolute alcohol; the aqueous solution is neutral, foams strongly, reduces Fehling's solution after boiling with acid, and gives a precipitate with basic lead acetate which is soluble in acetic acid.

Ephedra Monostachya. P. Spehr. (*Amer. Journ. Pharm.*, August, 1890.) This shrub is used in Southern Siberia as a popular remedy in gout and syphilis, a decoction of the branches and root being employed, while the pseudo-fruit, containing 13.89 per cent of sugar, either candied or its gelatinous juice, are esteemed in pectoral complaints. The stem attains a height of about two feet and has numerous round, warty and forking branches resembling equisetum; the dividing points are knotty and bear quite small, membranous sheathing and 2- or 4-parted leaves which, on drying, become easily detached. The root consists of a tuberously enlarged main root sending out long, horizontal branches 2 inches thick, and like their descending branches, which have the size of a quill, twisted around their eccentric axis. The exfoliating bark of the root is tough, but the wood after drying is easily split in a radial direction into thin layers and may be rubbed to powder between the fingers. The stem is free from starch, but the root contains a small quantity in some parts of the medullary rays. Tannin and pyrocatechin are present in the overground portion but not in the root. The root yielded a minute quantity of an amorphous alkaloid, while from the branches 0.03 per cent. of a pure crystallized alkaloid was isolated. Its composition corresponds to the formula $C_{13}H_{19}NO$. The pure alkaloid does not give any characteristic colour reaction. It melts at $112^{\circ}C$., and its hydrochlorate at $207^{\circ}C$. The alkaloid is readily soluble in water and alcohol, is nearly insoluble in petroleum benzol, and requires 11 parts of chloroform, 1,180 parts of benzol, and about 100 parts of ether for solution; oxidation with permanganate yields benzoic acid. The taste is at first imperceptible, then becomes burning and benumbing. Professor Kobert observed it to exert toxic effects upon frogs, but doses of 0.2 gram given to dogs and cats were almost without action. The alkaloid differs from ephedrine and pseudophedrine of *Ephedra vulgaris*, which have a bitter, astringent taste and a mydriatic and poisonous action.

Monesia Bark. P. G. Rozanoff. (*Amer. Journ. Pharm.*, July, 1891.) Monesia bark from *Chrysophyllum glycyphlaeum*,

has been studied by the author, who considers it to be a very good expectorant, due to the presence of saponin and monesin. It is rich in tannin and possesses valuable astringent properties.

Muawi Bark. E. Merck. (*Chem. Centr.*, 91, 414.) This bark, the botanical origin of which is not known, possesses toxic properties similar to those of sassy bark (*Erythrophloeum guineense*), but is stronger and quicker in its action. The author has isolated from it an uncrystallizable alkaloid, muawine, which is soluble in alcohol, ether and chloroform and resembles erythrophleaine.

Elder Bark as a Diuretic. G. Lemoine. (*Amer. Journ. Pharm.*, December, 1890.) The author recommends the inner white bark of the European elder, *Sambucus nigra*, as a valuable diuretic. A handful of the fresh material is boiled in a liter of water, and the decoction administered during the day. It is also stated to have a laxative action.

Jambul Bark. N. Wender. (*Chemist and Druggist*, March 28, 1891.) The fruit and seeds of *Eugenia Jambolana* has been the subject of numerous researches. The author has given his attention to the bark. This he finds to be occurring in large hard pieces up to 1 cm. thick, and covered externally with reddish and grey braids or scales, which may be easily rubbed off. The bark, freed from these braids, possesses a reddish yellow exterior. Internally the bark is dark brown, and shows longitudinal fibres. The fracture is fibrous, the taste astringent from the proportion of tannic acid contained in it. A cross-section of the bark permits the distinguishing of two differently coloured layers, of which the outer one is bright brown, nearly 2 mm. broad, with deep fissures, and rough, lumpy upper surface. It also shows numerous concentric slight dark lines. The inner part of the bark is pink to chocolate-brown, with smooth, longitudinal fibres, and is two to three times as broad as the outer part. In the brown ground-mass of the inner cross-section of the bark numerous white spots and points may be seen in almost concentric arrangement, imparting to this portion of the bark a marble-like appearance. The rather large spots, which may be seen even with the naked eye, are characteristic of the genus.

Pomegranate Root Bark from Java. M. Stoeder. (*Nederl. Tydsch. Pharm.*, 1890, 299; *Pharm. Journ.*, 3rd series, xxi. 379.) The author has examined samples of the root bark of *Punica Granatum* from roots growing wild in Java. The bark is said to be used as a remedy against tænia by the natives of Java, who recognise three varieties, derived respectively from plants bearing

red ("merah"), white ("poetih") and "black" flowers ("hitam"). They prefer the variety "poetih" as being the most active, and this preference seems to be justified by the results of analyses. The author separated the alkaloids as hydrochlorides, and found the bark from the white-flowered plant to yield 3.75 per cent., that from the red-flowered plant 2.430, and that from the "black"-flowered plant 1.71 per cent. The samples are described as having been received in quills which had evidently been taken from slender roots, all surrounded by the cortical layer.

Pomegranate Root Bark. E. Aweng. (*Pharm. Zeit.*, 1890, 417.) The observation that this bark, when kept for some length of time, loses much of its physiological activity and may even become totally inert, has induced the author to make a series of comparative experiments with various specimens of this kind and with a sample of fresh bark obtained from Italy. His results clearly indicate the nature of the changes which the bark from either stem or root undergoes on keeping. The alkaloidal constituents, which at first are freely soluble, become gradually less so, and are consequently yielded with difficulty and very imperfectly to water and alcohol by the older samples of the bark. Subsequently these principles undergo decomposition and thus finally disappear altogether. In the author's opinion a good quality of the bark should answer the following test:—20 grams of the powdered bark are macerated for twenty-four hours in 190 grams of water; the resulting infusion is boiled until it is reduced to 29 grams, then filtered, and when cold mixed with 5 grams of calcium hydrate. The mixture is allowed to stand for an hour, after which it is filtered, then very slightly acidulated with hydrochloric acid, and mixed with Meyer's reagent, which ought to produce a copious white precipitate. The residue is washed with 150 grams of water, and afterwards intimately mixed with 5 grams of calcium hydrate and sufficient water that after an hour's standing 5 to 10 c.c. of liquid can be expressed from it; this, when filtered, and then acidulated, should only produce a turbidity on the addition of Meyer's reagent.

The author also finds different samples of the bark to vary very much, not merely in the proportion of total alkaloids, but also in the relative proportions of the active bases (pelletierine and isopelletierine) as compared with the inactive ones (methyl- and pseudo-pelletierine).

Pomegranate Root Bark. J. E. de Vrij. (*L'Union Pharm.*, February, 1891.) The author disagrees with the statement made

by Aweng to the effect that this bark, when kept, loses in activity through a change in the condition of the alkaloids, and states that some of the bark which he had brought from Java and kept in a tin box for eleven years proved very active in every instance. Of the three varieties of pomegranate occurring in Java he regards the white-flowering variety as the most active.

The author considers a dry pulverized extract taken in wafers as the best form of administration, and recommends this extract to be made by exhausting the powdered bark with cold water and evaporating at a low temperature.

Constituents of the Bark of Nerium Oleander. E. Pieszczyk. (*Archiv der Pharm.*, ccxxviii. 352-361.) By treating the bark with light petroleum, a liquid fat and a wax-like crystalline compound were extracted. The bark was then exhausted with alcohol, the solution distilled to remove most of the alcohol, and filtered to remove a remnant of fat and a caoutchouc-like deposit. After several days, nodular aggregates of very minute, almost colourless, crystals formed. On recrystallization from dilute alcohol, the substance was obtained as a colourless, soft crystalline mass, insoluble in water, light petroleum, ether, and chloroform, but easily soluble in alcohol. On warming with dilute hydrochloric acid, it gave the glucose reaction with alkaline copper solution. The alcoholic solution was not precipitated by tannin, platinic chloride, mercuric chloride, iodised potassium iodide, Nessler's reagent, lead acetate, or ammonia. It fused at 171° , then decomposed with separation of carbon, and burned with a smoky flame. It dissolved in concentrated sulphuric acid with a reddish brown colour, not essentially changed by bromine vapour. The name *rosaginin* is proposed for this glucoside. It is exceedingly poisonous, resembling strychnine in its action. The mother liquor from the *rosaginin* contained *nerin*, a glucoside identical with the compound obtained by Schmiedeberg from the leaves of the same plant.

Small quantities of a volatile oil of disagreeable odour, and a crystalline, fluorescent compound were also obtained.

Chinese Cinnamon. H. Humphreys. (*Pharm. Journ.*, 3rd series, xxi. 123.) The author doubts the correctness of the general supposition that Chinese cinnamon is a cassia. The six samples he worked on he found to differ from cassia in appearance, taste and smell, and to contain little or no mucilage. On the other hand the iodine test gave a similar reaction to cassia. Chinese cinnamon grows wild in Annam much further south than the West River in

the Kwangsi and Kwangtung provinces, where cassia is cultivated. The Chinese adopt the common name of Kwei for both cinnamon and cassia, but distinguish the two by an additional name; for instance, ordinary cinnamon is Jan Kwei and ordinary cassia Kwei pi.

Chinese cinnamon is never exported, owing to the heavy prices the Chinese pay for it. There are a good many varieties, all of which grow wild in Annam, in the neighbourhood of a mountain called Ching Fa. The most expensive kinds come from the mountain itself, and are obtained from trees one or two hundred years old. Owing to the enormous price the Chinese pay, the trees are denuded of their bark and consequently die.

The author mentions *Ching Fa Kwei*, from the Ching Fa mountain, *Poo Kwei* (bitter cinnamon) and *Ye Kwei* (wild cinnamon) as very scarce and expensive kinds, while *Ngoi Ho Kwei* and *Ko Shan Kwei* are referred to as cheaper qualities. All the samples are strongest in flavour in the liber, which part agrees with Ceylon cinnamon.

The paper concludes with a summary of the observations already made on the subject by various authors.

Assay of Cinchona Bark. W. Haubensak. (*Schweiz. Wochenschr. für Pharm.*, 1891, 147; *Amer. Journ. Pharm.*, July, 1891.) The following method is recommended by the committee for the new Swiss Pharmacopœia:—20 grains of the bark in *very fine* powder are placed in a flask holding 500 c.c., 10 c.c. of a 10 per cent. solution of ammonia and 20 c.c. of alcohol (94 per cent.) added; the mixture is well shaken and then agitated with 170 c.c. of ether, after which it is allowed to stand for two to three hours, shaking occasionally. 100 c.c. of the clear liquid are decanted into a separating funnel containing 50 c.c. of water and 2 c.c. of dilute sulphuric acid (sp. gr. 1.117), or sufficient to give the aqueous solution an acid reaction after agitation with the ethereal solution; the acid, yellowish solution is separated from the ethereal layer, warmed to expel the dissolved ether and returned to the cleansed separating funnel; 30 c.c. of chloroform are now added, and sufficient sodium hydrate solution to precipitate the alkaloids. The mixture is quickly shaken for several minutes; the chloroform solution is removed to a small tared flask and the agitation repeated with portions of chloroform of 20 c.c. each until the alkaline solution, after acidifying, fails to give a precipitate with iodine solution. The chloroform is then allowed to evaporate, and the contents of the flask dried at 100° C. to constant weight.

Rhamnus Californica. K. Brandyle. (*Pharm. Record*, February 19, 1891; *Pharm. Journ.*, 3rd series, xxi. 881.) The authoress contends that *R. Californica* and *R. Purshiana* are only forms of one species, and adduces the plant known as *R. tomentella* as an argument in favour of the contention. This plant is said to run in the northern part of Lake and Colusa Counties into broad-leaved forms which apparently bear the same relation to *R. Purshiana* that the southern *R. tomentella* does to *R. Californica*, and it is remarked that it can hardly be supposed that if the species are distinct each can have a variety *tomentella*, varying in the same manner as the species. So far as can be gathered from the statements made, it appears that the fruit varies in the number of lobes, just as *R. Frangula* and *R. catharticus* do in this country, but it seems that the shape and character of the endocarp have not received the attention they deserve, and an examination of them might throw some light upon the question at issue. Professor Rusby relies upon the channelled character of the midrib, but this the authoress says is variable.

Drimys Aromatica and D. Dipetala. J. H. Maiden. (*Pharm. Journ.*, 3rd series, xxi. 721.) Both these trees are known in Australia locally as "Pepper-trees." The dried fruit of *D. aromatica* is black, rather shrivelled, sub-globular, with short stalks, and much resembling cubebs in appearance, except for the minute brown scars (varying from one to six or more). It breaks readily between the teeth, forming a gritty powder, but in a very short time it causes a burning sensation on the tongue and roof of the mouth. It is very acrid, with a flavour like allspice, only much more intense. The leaves and bark also have a hot, biting, cinnamon-like taste. The bark, leaves, and fruit are, as is well known, sometimes used by country people as a substitute for pepper. The barks of these two species are being tested for their medicinal properties.

D. aromatica finds its most northern extension on the Sugar Loaf Mountain (Braidwood), and perhaps a trifle more north in the Clyde Mountains—though it has not yet been seen north of the Sugar Loaf Mountain. In the Gippsland ranges, it attains its greatest height and diameter in the jungle, where it is often found as a small handsome tree about 20-25 feet high and from four to six inches in diameter. On the slopes of the Snowy Mountains it sometimes forms dense jungles which are there called "pepper scrub." It ascends to an altitude of more than 6,000 feet, but is then always shrubby.

D. dipetala is a small gully-tree which bears a considerable quantity of fruit of a plum colour up to nearly black when fully ripe. They are in shape like a roly-poly, and up to $1\frac{1}{4}$ inch by $\frac{3}{4}$ inch in diameter. They are succulent, and may be eaten with impunity, tasting like a nearly insipid apple, but the few small black seeds which they contain, which are from pear to kidney-shaped, are exceedingly pungent, tasting like *D. aromatica* fruits if chewed.

The present species is not so well known as *D. aromatica*, nor has any use been made of either bark, leaves, or fruit. The ripe fruit, when bruised and steeped in hot water, makes a beautiful dark red to purple liquid, a teaspoonful of which added to a glass of water makes a pleasant refreshing drink.

Picrasma Eilantoides. M. M. Shimojama and Hirano. (*Communications [Mitteilungen] from the University of Tokyo*, i. 357; *Pharm. Journ.*, 3rd series, xxi. 1170.) *Picrasma eilantoides* is known in Japan as "nigaki," or "bitter wood." It is described as being yellow, and derived from a tree growing to a height of ten metres, the bark in which the bitterness principally resides being relatively very thin, grey, and somewhat shiny. The authors obtained from a decoction of two kilograms of the finely powdered bark 0.24 grams of crystal that melted at 205°C ., and otherwise corresponded in their characters with quassia.

The Leaves of Strychnos Nux-Vomica. D. Hooper. (*Pharm. Journ.*, 3rd series, xxi. 493). The author's experiments show that the alkaloid of the leaves of *strychnos nux-vomica* is brucine, and that strychnine appears to be absent. As brucine has the same physiological effects as strychnine in inducing well-marked tetanic symptoms, the leaves taken in sufficient quantity would produce poisonous results. Compared with the seeds, the leaves contain about one-tenth the amount of total alkaloid, but, notwithstanding the smaller proportion of brucine present, the leaves would be highly injurious as fodder, and precautions should be taken in keeping cattle from feeding upon them.

Other constituents of *nux-vomica* leaves are an acid resin, soluble in spirit and aqueous alkalies, and dissolved by sulphuric acid with a green colour changing to reddish brown, and a caoutchouc-like substance dissolved by benzol, but not by spirit or alkalies. An organic acid, probably the strychnic or igasuric acid of older writers, is associated with the alkaloid in both the alcoholic and aqueous extracts. It strikes a green colour with ferric chloride, and is removed from solution by neutral plumbic

acetate. Crystals of a body which might be referred to loganin separated from the hot chloroform-alcohol extract, but the author could not obtain much more than a trace of this body from the alcoholic extract after the removal of other substances by ether. The dried leaves afforded 11·86 per cent of ash.

Composition of the Leaves of *Maclura Aurantiaca*. A. Pizzi. (*Chem. Centr.*, 1890, ii. 766.) The leaves of *Maclura aurantiaca* are used in the silk-worm culture as a substitute for the mulberry. The following is the analysis:—

Water	65·710
Fat	0·613
Proteids	4·775
Non-proteid nitrogenous substance	3·230
Cellulose	9·522
Sugar, starch, etc.	12·679
Mineral matter	3·421

The composition of the ash is:—

K ₂ O	Na ₂ O	MgO	CaO	Fe ₂ O ₃	SiO ₂	P ₂ O ₅	SO ₃	Cl.	Loss, etc.
9·244	6·156	6·727	25·732	3·814	26·247	17·543	2·405	1·327	1·805

A New Constituent of *Carica Papaya*. M. Greshoff. (*Amer. Journ. Pharm.*, March, 1891.) The author has found the leaves of *Carica Papaya* to contain about 0·25 per cent of a new alkaloid, having a very bitter taste. The fruit and the milky juice of the plant contain only traces of it. The name "carpaine" is proposed for this new constituent.

Constituents of *Lobelia Inflata*. C. Siebert. (*Apoth. Zeit.*, August 13, 1890, 464.) By exhausting the herb and seed of *Lobelia inflata* with water acidulated with acetic acid, saturating the extract with sodium bicarbonate and shaking with ether, the author has in both cases obtained a liquid base the composition of which corresponds to the formula C₁₈H₂₃N O₂. He feels still uncertain as to whether the two products are identical or isomeric, though they show a close agreement in their behaviour towards vanadium-sulphuric acid and Froehde's reagent, and in the properties of their platinochlorides.

***Lobelia Purpurescens*.** J. H. Maiden. (*Pharm. Journ.*, 3rd series, xxi. 559, from the *Proceedings of the Linnean Society of New South Wales*.) A sample of *Lobelia purpurescens* was sent to the author as "a newly discovered antidote to snake-bite." The plant is stated to have the same active properties as *Lobelia inflata*, and might be used as a substitute for it. An analysis

carried out by the author in conjunction with Mr. Hamlet proves the presence in this species of the liquid alkaline lobeline.

Mineral Constituents of Tobacco Leaves. J. M. van Bemmelen. (*Land. Versuchs-Stat.*, xxxvii. 409-436.) Ash analyses are given of tobacco from Java, Mexico, Japan, Hungary, and Virginia. The results show that leaves of the best quality contain 12 to 15 per cent. of mineral matter (silica excluded), not much chlorine and sulphuric acid, no soda, or very little, and much potash, lime, and magnesia in combination with organic acids; that in the ash, not only the relation between the carbonates and the chlorides and sulphates ($\text{CO}_2 : \text{Cl} + \text{SO}_3$) is high (not under 7), but also that the relation between the potash and chlorides and sulphates ($\text{K} : \text{Cl} + \text{SO}_3$) is not under 2.

Constituents of Chelidonium Majus. F. Selle. (*Archiv. Pharm.*, ccxxviii. 441-462.) In confirmation of E. Schmidt's results the author finds this plant to contain, in addition to chelidonine and chelerythrine, three more alkaloids, viz., *α-homochelidonine*, $\text{C}_{19}\text{H}_{15}(\text{OMe})_2\text{NO}_3$, *β-homochelidonine*, $\text{C}_{19}\text{H}_{15}(\text{OMe})_2\text{NO}_3$, and a base seemingly identical with *protopine*, an alkaloid obtained by Hesse from opium. The following general method is used to extract the bases from the root of the plant. The dried and pulverised material is repeatedly extracted with alcohol containing acetic acid; after filtration and dilution with water, the alcohol is distilled off and the resin separated is removed by another filtration. The filtrate is treated with ammonia and shaken up with chloroform; the chloroform solution on evaporation leaves a residue which is dissolved in the least possible amount of alcohol containing hydrochloric acid. After cooling, the alcoholic solution is separated by filtration from the undissolved and crystalline portion, consisting of chelidonine and protopine hydrochlorides. The alcoholic solution is diluted with water, freed from alcohol, strongly diluted with hydrochloric acid water, filtered, and treated with ammonia in excess. The filtrate contains *β-homochelidonine*, which may be extracted by shaking up with alcohol. The precipitate contains *α-homochelidonine* and chelerythrine; the latter can be obtained by long digestion with ether.

Cannabis Indica in Indigestion. G. Sée. (*Chemist and Druggist*, October 4, 1890.) The author has employed extract of Indian hemp with very good results in two forms of dyspepsia, the first comprising alterations in the chemical composition of the gastric juice, attended with heartburn and intolerable acidity. The second group related exclusively to the gastro-intestinal neuroses which

occurred without any chemical modification of the gastric juice. He found that cannabis acted in such a manner as to mitigate the painful sensations and to re-establish the appetite, whatever might be the condition by which the pain and other phenomena were produced. The dose given was $\frac{1}{4}$ grain three times a day. This dose should not be exceeded, as the drug then acts too powerfully as a narcotic.

Constituents of *Chrysanthemum Cinerariæfolium*. F. Marino Zucc. (*Chem. Centr.*, 1890, 560-561.) In addition to the paraffin and a homologue of cholesterol, which the author has already described, he has further separated a glucoside and an alkaloid from the flowers of *Chrysanthemum cinerariæfolium*. Both were obtained from the flowers by extraction with ether. The glucoside is crystalline, but could not be obtained in sufficient quantity for proper investigation. The alkaloid, named *chrysanthemine* by the author, is readily soluble in water, and its solution may be concentrated on the water-bath without decomposition, whereby the base is obtained as a colourless syrup. The majority of its salts are soluble in water, alcohol, and ether, and are crystalline. The most characteristic of these is the aurochloride, which crystallizes in small, golden-yellow needles, very soluble in hot water, sparingly so in cold water, readily in alcohol, and moderately soluble in a mixture of alcohol and ether (1:1). Potassium bismuth iodide forms a yellow precipitate with it, and potassium mercury iodide forms a yellowish white precipitate. Platinum chloride, tannin, and picric and phosphotungstic acids do not form precipitates with it. The analysis of the aurochloride agrees with the formula $C_{14}H_{30}O_3N_2, 2AuCl_4$, according to which the formula of the hydrochloride would be $C_{14}H_{30}O_3N_2Cl_2$.

The Toxic Principle of Pyrethrum Flowers. F. Schlagdenhauffen and E. Reeb. (*Pharm. Journ.*, 3rd series, xxi. 63. From *Journ. der Pharm., Elsass-Lothringen*.) The author finds that the active principle of pyrethrum flowers is an acid soluble in alcohol, amylic alcohol, ether and chloroform, which may be isolated by means of ether after having been converted into an alkaline salt and decomposed by tartaric acid in aqueous solution.

When pyrethrotoxic acid was hypodermically injected into animals, it was observed that the poison produced its effects in two distinct stages. In the first there was an excitement more or less pronounced, proportional to the quantity administered; in the second there was a complete prostration, accompanied always by paralysis of the lower extremities, which might disappear after

a time, or be the precursor of a fatal issue, the respiration and circulation being affected only in the latter case.

Saffron, its Adulterations and their Mode of Detection. F. F. Riches and J. Dunning. (*Pharm. Journ.*, 3rd series, xxi. 611.) If the sample is suspected of being weighted with a mineral, it is recommended to be placed on the surface of water and gently stirred, when the water immediately becomes turbid and gradually the powder subsides, if allowed to stand. In all samples a small quantity of pollen thus deposits, but its nature can be detected under the microscope. The nature of any soluble mineral matter present may be ascertained by testing the aqueous infusion for ammonium salts, nitrates, etc., etc., in the usual way. The insoluble salts in the deposit have to be rendered soluble by fusion with alkaline carbonates and then examined according to the ordinary rules of analysis. The colouring matter, if logwood, is removed by animal charcoal. Nitrocresylate of sodium, which is the dye most usually employed, may be detected by soaking in petroleum spirit, when the spirit acquires a lemon-yellow colour, the colouring matter of saffron not being soluble in that liquid. Particulars are given in the paper respecting the examination of ten specimens of saffron, in which these processes for the detection of adulterations are explained in detail.

Artemisia Frigida. F. A. Weiss. (*Amer. Journ. Pharm.*, October, 1890.) This plant is known in Colorado as *sierra salvia*, or *Colorado mountain sage*, and as a medicinally valuable herb has obtained considerable repute throughout the Western States. It is given in the form of hot infusion, with the addition of sugar and a small quantity of capsicum. The hot infusion has a diuretic, an antiperiodic, and sometimes a mild cathartic action. Its use is recommended in convalescing cases of scarlatina and diphtheria, given as a cold infusion (two troy ounces to the pint), one wine-glassful as a dose, three times a day, and at bed-time when action on the kidneys is desired. The herb grows among the Rocky Mountains, from Colorado to Idaho, at altitudes from 4,500 to 9,000 feet above the sea level, either in dry, sandy localities, among rocks, or in the lower valleys, and occasionally upon the more fertile plains; but it is never found in swampy regions.

The author's analysis of the stems, leaves and flower buds, as medicinally employed, shows the following composition:—

	Per cent.
Moisture	12
Ash	9.5
Petroleum ether extract, containing volatile oil, fat, wax, and chlorophyll	5.5
Ether extract, containing bitter principle	2.5
Absolute alcohol extract, containing tannin and bitter principle	2.75
Water, soluble matter, cellulose, etc.	67.75

Solanum Carolinense. G. A. Krauss. (*Amer. Journ. Pharm.*, 1890, 601-604; 1891, 65-67, and 216-221.) This perennial herb grows in abundance in the Southern States along the roads and in dry places, and reaches a height of nearly 2 feet. The root is thin, has a thick bark, and attains a length of from $1\frac{1}{2}$ to $2\frac{1}{2}$ feet, descending vertically. The stem is erect; the leaves are broadly oblong, sinuate, serrate, and their midrib as well as the petiole are beset with numerous prickles. The flowers are rather large with a united 5-cleft corolla, and a calyx consisting of 5 sepals; 5 stamens and a prominent pistil with one stigma. It flowers from June till September. The fruit is a berry about $\frac{1}{2}$ inch in diameter, and contains numerous seeds around a central placenta. The plant is stated to cause much loss to the farmers through cattle-poisoning.

The author has chemically examined the root-bark, the leaves, and the berries of this plant, and reports that all parts contain the alkaloid *solanine*, and probably also *solanidine*, in combination with an organic acid, for which he suggests the provisional name of *solanic acid*.

Galega Officinalis as a Galactagogue. C. de la Carrière. (*Journ. de Méd.*, April, 1891; *Amer. Journ. Pharm.*, June, 1891.) The author has obtained results from the use of galega, which lead him to hope for its restoration to therapeutic use. He used the aqueous extract (equal to one-fifth of the weight of the dry plant), making it from the fresh plant. The extract has a pronounced odour, is very soluble in water, is incompletely so in alcohol, and is given in quantities of 1-4 grams daily, in fractional doses of 50 cgm. to 1 gm.

Marrubium Vulgare. J. W. Morrison. (*Amer. Journ. Pharm.*, July, 1890, 327.) In addition to marrubiin, which was first discovered by Mein in 1855, the author has isolated from this plant two other bitter principles, one extracted by ether, and the other by chloroform. Both of these give a glucosidal reaction. Marrubiin, according to Kromayer, is not a glucoside. The

presence of these two bodies explains Hertel's statement that after the separation of marrubiin the fluid extract appeared to be as bitter as before.

Marrubiin appears to approximate closely to absinthiin, $C_{40}H_{58}O_9$, both in composition and its main properties, but to differ from it in its melting point.

Haplopappus Baylahuen, C. Gay (Hysterionica Baylahuen), Baillon. H. H. Rusby. (*Amer. Journ. Pharm.*, October, 1890.) The author has examined this plant which is used in the province of Coquimbo as an antihystericum and in veterinary medicine for the treatment of wounds. He found a volatile oil, a fatty oil, this having the specific odour of the plant, a brown acid resin of sharp taste, and tannin. The taste is said to resemble pichi.

Lolium Temulentum. P. Antze. (*Archiv exp. Path. und Pharmac.*, November, 126. From *Pharm. Journ.*) The poisonous darnel grass (*Lolium temulentum*) is found throughout Europe, and in wet years has been frequently harvested with oats and barley in sufficient quantity to poison persons partaking of bread, or even beer, prepared from the grain. Previous chemical investigations of the seed have only shown the presence of a bitter principle decomposed by the action of weak acids. The author has recently examined the constituents of the plant, both chemically and physiologically, and reports the isolation of a volatile alkaloid, "loliine," and "temulentie acid," which by the action of lime yields a base "temulentine," as a decomposition product. Loliine is said to yield good crystalline salts with sulphuric, hydrochloric, oxalic and acetic acids, but too small a quantity was obtained for analysis. Injected subcutaneously into rabbits it produced a rise in temperature as well as an increase of the pulse, 0.08 of a gram being a lethal dose, whilst the narcotic and intoxicating action of the lolium plant seems to be due to temulentie acid and the base obtained from it. The acid, which exists to the extent of about 1 per cent. in the seeds, is obtained in crystals melting at 234° C. and possessing the approximate composition $C_{12}H_{24}NO_{19}$, and as well as temulentine yields good crystalline salts. From experiments upon frogs, rabbits and the investigator himself, it appears to be twice as toxic as loliine and rapidly diminishes the heart's action, but if the depression, which is accompanied by a marked decrease in temperature, is overcome, the patient assumes a condition of high fever. The author recommends in cases of poisoning with darnel grass the adminis-

tration of emetics and purges, followed by stimulants to raise the depressed action of the heart.

Loco Weeds. T. J. Power and J. Cambier. (*Pharm. Rundschau*, January, 1891. From *Pharm. Journ.*) The authors report the discovery of toxic alkaloids, but in very small quantity (0.2 gram from 3 kilos of *Astragalus*), in two of the plants known as loco weeds, which in the United States are said to cause a peculiar wasting disease fatal to cattle. The plants examined were *Astragalus mollissimus*, and *Crotalaria sagittalis*. The alkaloid of the former in the dose of 0.1 gram produced frothing at the mouth and a profuse flow of saliva, which is one of the symptoms produced by the loco weeds.

Yerba Santa. H. C. Cleveland. (*Amer. Journ. Pharm.*, December, 1890.) The author's analysis shows that *Eriodictyon glutinosum* contains the following constituents:

Matter extracted by ether (a bitter, acrid, brittle resin, about 9 per cent.; green colouring matter, wax and tannic acid in small quantities)	15.10
A volatile oil in very small quantities.	
Moisture	12.25
Matter extracted by alcohol (inert, resinous matter decolorized by animal charcoal; a peculiar glucoside of the tannic acid series prevailing in the mass)	11.02
Matter extracted by water (tannic acid, gum, trace of sugar, brown extract, inert substance)	18.34
Wood, fibre and ash	43.29
	<hr/>
	100.00

Alcohol of 75 per cent. was found to be the best menstruum for galenial preparations. The following formulæ are recommended:—

Extractum Eriodictyi Fluidum.

Eriodictyon, No. 50 powder	100 grams.
Alcohol	75 "
Water	25 "
Or enough to make one hundred cubic centimetres.	

Moisten the powder with 30 c.c. of alcohol, pack firmly in a cylindrical percolator, then add enough alcohol to saturate the powder and leave a stratum above it. When the liquid begins to

drop from the percolator close the lower orifice. Cover the percolator. Macerate for forty-eight hours, then allow percolation to proceed, adding menstruum until the drug is exhausted. Reserve the first 85 cubic centimetres of the percolate, and evaporate the remainder to a soft extract. Dissolve this in reserved portion, and add menstruum enough to make the fluid extract measure 100 cubic centimetres.

Extractum Eriodictyi.

Evaporate the fluid extract to a pilular consistence, then weigh and incorporate while still warm 5 per cent of glycerine. Appearance greenish brown.

Syrupus Eriodictyi.

A syrup prepared from eriodictyon leaves is extensively used for the purpose of disguising the bitter taste of quinine. The peculiar property of the eriodictyon leaf, of imparting to quinine the taste of starch when chewed and held upon the tongue for a few seconds, has been well known for years to the old settlers of California.

A syrup may be prepared from the fluid extract in the proportion of 1 ounce of fluid extract to the pint, and should be made according to the following formula:—

Fluid extract eriodictyon	. . .	1 fl. oz.
Calcined magnesia	. . .	$\frac{1}{2}$ av. oz.
Water	. . .	$7\frac{1}{2}$ fl. oz.
Sugar	. . .	14 av. oz.

Mix the fluid extract with calcined magnesia and add the water gradually, with constant stirring; let it stand twenty-four hours and filter; add the sugar and dissolve with the aid of gentle heat.

A fluid extract which will mix directly with simple syrup and form a limpid preparation can be best obtained by the following process:

Eriodictyon leaves, 40 powder	. . .	16 tr. oz.
Potassium carbonate	. . .	3 "
Solution of ammonia	. . .	} quantities given below.
Alcohol	. . .	
Water	. . .	

Mix the solution of ammonia and water in the proportion of 1 part of the former to 7 parts of the latter. Moisten the drug with 8

fluid ounces of this menstruum and pack it firmly into a cylindrical percolator; macerate for twenty-four hours and percolate slowly, until 3 pints of percolate are obtained. To this add the potassium carbonate, and evaporate until a pasty residue is left. Stir this well with 8 ounces of alcohol gradually added. Let the pasty precipitate subside and decant the supernatant liquor; to the residue gradually add 8 fluid ounces of alcohol as before. Pour this mixture upon a strainer and press out the liquid. Should this second extraction measure more than is needed to complete the intended volume of fluid extract (16 fluid ounces) dissipate the excess of alcohol by appropriate means; unite the residue with the first extraction. Set the mixture aside for twenty-four hours and decant the clear fluid extract from the scant crystalline deposit meanwhile formed.

Randia Dumetorum. Sir J. Sawyer. (*Lancet*, March 21, 1891.) The author attributes the action of this drug as a nervine calmative and antispasmodic to the saponin and valeric acid contained in it. He employs it in the form of a tincture made with spiritus ætheris, B.P. He has experimented also with tinctures made with proof spirit, rectified spirit, and aromatic spirit of ammonia, but prefers the ethereal tincture, because when diluted with water and acidulated with acetic acid, the odour of valerian is more apparent than in the other tinctures. The tincture is described as having a characteristic strong odour and taste, and being of a bright maize colour; the dose is from 15 to 60 minims diluted with water, but the strength is not stated.

Chemical Notes on Plants growing in the Dutch Indies. M. Greshoff. (*Journ. Chem. Soc.*, March, 1891, 334. From *Ber. der deutsch. chem. Ges.*) The leaves of the papaya (*Carica papaya*, L.) contain, in addition to the caricine and papaïne discovered by Wurtz and Peckolt, an alkaloid which has not previously been prepared, and for which the name *carpaïne* is proposed. The young leaves are richest in the alkaloid, and contain about 0.25 per cent.; the sap, seeds and roots only contain traces. Carpaïne is readily soluble in alcohol, chloroform, and ether, the freshly precipitated compound being more readily taken up by the latter solvent than when crystallized, a fact which is made use of in isolating the alkaloid. It is completely separated from solutions of its salts by sodium carbonate solution, but is insoluble in potash, and cannot be extracted from acid solution. It gives precipitates with Mayer's solution, iodine, phosphomolybdic acid, picric acid, gold chloride, tannin, potassium thiocyanate, etc.,

melts at 115° , and sublimes partly without decomposition. Its *hydrochloride* crystallizes in beautiful, lustrous needles, and is readily soluble in water. The base, even when dissolved in 100,000 parts of water, has a bitter taste, and is only poisonous in large doses, but small quantities readily kill smaller animals, the action taking place on the heart.

Investigation of Indian Leguminous Plants.—The plant known as *Derris* (*Pongamia*) *elliptica*, Benth., is largely used in Java in fishing, and appears also to be a constituent of the Borneo arrow-poison. It has an exceedingly poisonous action on fish, a decoction of the roots being fatal even when diluted with 300,000 parts of water. The only active constituent isolated is a resinous substance termed *derrid*, which does not contain nitrogen and is not a glucoside; it readily dissolves in alcohol, ether, chloroform, and amyl alcohol, but is very sparingly soluble in water and potash solution. On fusion with potash, it yields salicylic and protocatechuic acids. It occurs almost entirely in the cortex of the root, but has not yet been obtained pure. Its alcoholic solution has a slightly acid reaction, and a sharp aromatic taste, causing a partial insensibility of the tongue, which remains for hours. A solution of 1 part in 5 millions is almost instantly fatal to fish. A very similar compound is found in the seeds of *Pachyrhizus angulatus*, Rich., a decoction of which is quickly fatal in a dilution of 1 : 125,000. It is probably identical with *derrid*, but until this has been experimentally proved it may be distinguished as *pachyrhizid*. It is very readily prepared from *Pachyrhizus*, which occurs in all tropical countries, as the tannin compounds, usually so difficult to separate, are not found in this plant. The seeds also contain a non-poisonous, crystalline compound, which is readily soluble in alcohol, and has at 30° the consistence of butter.

The plant *Sophora tomentosa*, L., formerly renowned as a medicine, ("*Anticholerica Rumphii*"), contains a poisonous alkaloid, soluble in ether, which is contained in largest quantity in the seeds. Alkaloids have previously been found in *S. speciosa* and *S. angustifolia*, but have not been closely investigated.

The bark of *Erythrina* (*Stenotropis*) *Broteroï*, Hassk., contains considerable quantities of an alkaloid, which may be readily isolated by Stas's method, and is easily soluble in ether. Its sulphate may be obtained in crystals from concentrated aqueous solution. It gives precipitates with many metallic salts and with the usual alkaloid reagents; it is a fairly strong poison, being

fatal to fowls in doses of 0·025 gram. A poisonous alkaloid likewise exists in *Erythrina* (*Hypaphorus*) *subumbrans*, Hassk., and is best isolated as a metallic double compound.

The leaves of different kinds of cassia are employed in Java as a remedy for herpes, they contain a glucoside which yields chrysophanic acid as a product of hydrolysis.

The leaves of *Crotolaria retusa*, L., contain considerable quantities of indican; the seeds contain an alkaloid, which is found in larger quantities in the seeds and leaves of *C. striata*, L. The base is a strong poison, and is probably closely related to the known alkaloids of other Genistææ, such as *Cytisus*, *Ulex*, *Spartium*, and *Lupinus*.

The seeds of *Millettia atropurpurea*, Benth., contain a poisonous glucoside, the chemical and toxicological properties of which closely resemble those of saponin. The plant is also employed for poisoning fish. The bark of *Acacia tenerrima*, Jungh., contains a bitter, poisonous alkaloid, readily soluble in ether and chloroform. No alkaloid has previously been found in an acacia. The leaves of *Albizia saponaria*, Bl., contain cathartic acid, whilst the leaves and bark contain saponin in quantity.

The bark of *Pithecolobium bigeminum*, Mart., contains 0·8 per cent. of a non-volatile, amorphous alkaloid, which forms crystalline salts, and separates as a heavy, yellow oil on the addition of alkalies to solutions of the latter. With 100 parts of water, it forms a turbid liquid, which on warming assumes the appearance of milk, but becomes clear on the addition of an acid. The solutions have a burning taste, and give the usual alkaloid reactions. It has a strong corrosive action on the skin, and is fatal to fish in a dilution of 1 : 400,000. The same compound appears also to occur in *P. saman*, Benth.

Apocynæ containing Alkaloids, occurring in the Dutch Indies.—The leaves, bark, and seeds of *Melodinus lavigatus*, Bl., all contain a poisonous alkaloid, which is present in the largest quantity in the seeds (0·8–1·0 per cent.). It is decomposed by dilute hydrochloric acid, but is not a glucoside, and gives the ordinary alkaloid reactions in very dilute solutions, and with feeble oxidising agents in sulphuric acid solutions gives a greenish coloration, which then becomes deep blue and finally orange.

Leuconotis eugenifolia, Dec., yields a poisonous crystalline alkaloid which is readily soluble in ether, and shows the general reactions of the alkaloids, but gives no colour reactions. The bark of *Rauwolfia canescens*, W., yields an alkaloid which gives

a beautiful, blood-red coloration with nitric acid *Rauwolfia* (*Ophioxylon*) *serpentina* and *trifoliata*, which is highly prized in Java as a drug, also contains a crystalline alkaloid which gives the same reaction with nitric acid, and its presence may be easily recognised microscopically in the various parts of the plant by this reaction. The substance recently described as ophioxylin is identical with Dulong's plumbagin, the error being caused by a confusion between *Ophioxylon serpentinum*, L., and *Plumbago rosea*, L., which, though very different plants, are both termed "Poeleh Pandak" in Java. The above alkaloid also occurs in *Rauwolfia* (*Cyrtosiphonia*) *spectabilis* and *madurensis*. All these species of *Rauwolfia* contain a brown substance also; this likewise appears to be an alkaloid, and yields a beautiful, blue, fluorescent solution in ether. It is constituent of many *Apocynaceae*.

The bark of *Hunteria corymbosa*, Roxb., contains 0·3 per cent. of a crystalline alkaloid, which also forms crystalline salts, and gives a beautiful violet coloration with Erdmann's and Fröhde's reagents. It is a strong poison, and has a sharp, burning taste, even when diluted to 1:10,000. The bark of *Pseudochrosia glomerata*, Bl., also contains a poisonous, crystalline alkaloid, and the above fluorescent compound.

The barks of *Ochrosia* (*Lactaria*) *acuminata*, *Ackeringae*, and *Coccinea* are rich in alkaloid constituents. Three products have been isolated, namely, a colourless, crystalline alkaloid soluble in ether, which is moderately poisonous, an alkaloid insoluble in ether but soluble in amyl alcohol, which is best isolated as the mercuriochloride, and also the above-mentioned fluorescent compound. These substances also occur in the seeds and the sap. The bark of the stem of *Ochrosia* (*Bleekaria*) *kalocarpa* contains 1·2 per cent. of alkaloids.

The seeds of *Kopsia flavida*, Bl., contain no less than 1·85 per cent. of a homogeneous alkaloid, which is soluble in ether and readily prepared pure and crystalline; it likewise occurs in *Kopsia arborea*, Bl., the leaves of which contain in addition a fluorescent substance. *Kopsia* (*Calpicarpum*) *Roxburghii* yields quite a different alkaloid, which causes tetanus. The seeds and leaves of *Kopsia* (*Calpicarpum*) *albiflorum* contain an alkaloid, as also do *Vinca rosea*, L., and *Alstonia* (*Blaberopus*) *villosa*.

Voacanga (*Orchippeda*) *foetida* yields a bitter alkaloid readily soluble in ether, and the fluorescent compound already frequently mentioned. *Tabernaemontana sphærocarpa*, Bl., also contains an alkaloid, and a wax-like compound which is free from nitrogen and

melts at 185°. Alkaloids are also present in *Rhyncodia* (*Cerco-
coma*) *macrantha* and in *Chonemorpha macrophylla*, Don, which
is of interest, inasmuch as those species both belong to the
Echitidiæ, the other members of which are free from alkaloids.

Cerbera odollam, Hamilt.—The sap, leaves, and bark of this
plant have no toxicological action, but the seed kernel contains,
in addition to a non-poisonous fatty oil, the compound *cerberin*,
which has a poisonous action on the heart. It resembles thevetin,
thevetosin, and tanghinin, but is identical with none of them. It
most nearly resembles the last-named substance, which is obtained
from *Tanghinia venenifera*, Poir., the “test-plant” of Mada-
gascar. Cerberin is free from nitrogen and crystallizes well, and
although decomposed by acids, is not a glucoside. It is insoluble
in water, but dissolves readily in alcohol, chloroform, acetic acid,
and 80 per cent. ether, and melts at 165°. It gives a violet
coloration with sulphuric acid, has a sharp, burning but not bitter
taste, and is very poisonous. The seeds contain another very
poisonous substance which is readily soluble in water, alcohol,
and amyl alcohol, but insoluble in chloroform, for which the name
odollin is proposed. It is not precipitated by lead acetate, and
gives the same colour reaction with sulphuric acid as cerberin.

Hernandia sonora, L., and *H. ovigera*, L., both yield an alka-
loid closely resembling the bebeerine obtained from *Nectandra*,
whilst *Illigera pulchra*, Bl., contains the new base laurotetanine
(see p. 42).

*The Distribution of Hydrocyanic Acid in the Vegetable King-
dom*.—The leaves of *Gymnema latifolium*, Wall, an Indian
Asclepiadæa, contain large quantities of amygdalin, which can,
however, only be obtained in the amorphous condition. The
leaves do not contain any enzyme, and may, therefore, be distilled
with water or dilute sulphuric acid without any hydrocyanic acid
or benzaldehyde passing over. On the addition of emulsin, hydro-
lysis readily takes place.

The fresh bark of many Javan forest trees gives off an odour
of bitter almond oil. It was found that *Pygium parviflorum*,
and *P. latifolium*, Miq., both contain amygdalin, which on botan-
ical grounds was not improbable, as the species *Pygium* is closely
related to *Amygdalus*.

When the fruit of certain Javan Aroïdes (the genera *Lasia*
and *Cyrtosperma*) is cut, a strong odour of hydrocyanic acid is
observed, and it was found on investigation that it is present in
the free state. It also occurs in the leaves of these plants. It

is found, however, in much larger quantity in a Javan tree known as *Pangium edule*, Reinw., the seeds of which, after cooking in a certain manner, are looked on by the Malays as a valuable food. If this cooking is insufficient, the seeds are a strong poison, and are used in Java for killing fish and insects. It was found on investigation that all parts of the tree contain free hydrocyanic acid. Thus the leaves, on distillation, yielded 0·34 per cent. which is equal to 1 per cent. on the dried leaves; in the other parts the proportion, although less, is still considerable. The amount of hydrocyanic acid is not constant, old *Pangium* leaves having been examined which only contained 0·045 per cent.

The leaves and seeds of the *Pangium* contain a substance which reduces ammoniacal silver solution and Fehling's solution in the cold, and whose solutions become dark-coloured in the air. Although no crystalline compound could be obtained with phenylhydrazine, it is probably a sugar, with which the hydrocyanic acid forms an unstable compound. The seeds, which are originally white, gradually become dark, the hydrocyanic acid disappearing at the same time.

The only poisonous constituent of the genus *Hydnocarpus* is also hydrocyanic acid. The fatty oils of certain species of *Hydnocarpus* are used externally in skin diseases, their value being possibly due to the antiseptic action of hydrocyanic acid.

Notes on some North American Medicinal Plants. J. M. Maisch. (*Amer. Journ. Pharm.*, July, 1890). *Hedeoma*.—This genus of labiateous plants comprises about fourteen species indigenous to North and South America. The best known and most widely-distributed species is *H. pulegioides*, which extends from New England to Dakota and southward, being met with in the Southern States on dry hills. From the resemblance of its odour and taste to the European *Mentha Pulegium*, Linné, it is known throughout the country as *pennyroyal* or *American pennyroyal*. Most, if not all, the other species of *Hedeoma* have a different odour. *H. piperita*, Benthams, for instance, is peppermint-like, and according to the *Mexican Pharmacopœia*, is used like and in place of peppermint. Some of the North American species are said to be locally employed. This is the case with *H. thymoides*, Gray, which grows in Texas on high land, and produces its pink and fragrant flowers in April. In Lavaca, and possibly in other parts of Texas, the plant has the reputation of being diaphoretic and febrifuge, the infusion being

employed. The taste of the plant is aromatic, citronella-like, and scarcely bitterish.

Colorado Cough Root.—Under this name a root has been received on several occasions, which is said to be commonly used in some parts of Colorado. It is derived from an umbelliferous plant, and may possibly be the root of a *Ligusticum*, of which four species are known to be indigenous to the State named (Coulter, *Rocky Mountain Botany*, p. 117). But in the absence of botanical specimens it was impossible to arrive at a reliable conclusion. The root is masticated, and is also employed in the form of powder as a snuff said to be efficient in catarrh and neuralgic affections.

Peppertree is the popular name of an ornamental tree which is not indigenous to North America, but is cultivated to some extent in California. The leaves as well as the reddish drupaceous fruits, which are of the size of black pepper, have a strong peppery flavour; hence the popular name. The tree belongs to the order *Anacardiaceæ*, and to a genus of about thirteen species, mostly of tropical America. *Schinus Molle*, Linné, grows from Mexico southward, and in the country named is known as *arbol del Peru*, indicating its South American origin. The bark, leaves, fruit, and the gum-resinous exudation are employed medicinally, the former as a balsamic astringent, the other products for their stimulating properties (*Amer. Journ. Pharm.*, 1866, p. 503, and 1885, p. 340). When the piperaceous taste is considered, and the fact that the fruit contains enough sugar to warrant its employment for the preparation of an alcoholic beverage and of vinegar, it is surprising that the different parts of the plant have not been subjected to analysis. The bark contains tannin; the gum resin contains about 60 per cent. of resin, and a little volatile oil, and the fruit was supposed by Landerer (1862) to contain piperine, which supposition, however, does not appear to have been verified or disproved by later investigations.

Some American Galls collected in the Neighbourhood of Philadelphia. H. Trimble. (*Amer. Journ. Pharm.*, November, 1890.) In July, 1890, a sample of galls was collected from the leaves of young white oaks, *Quercus alba*. They were about the size of a pea and characterized by a covering of purple spines. They were identified by L. O. Howard as having been produced by the insect *Acraspis erinacei*. The author found them to contain 17·9 per cent. of tannin. The moisture was found to be 45·95

per cent. and the ash, 0.60 per cent. The perfectly dry galls therefore contained 32.1 per cent. of tannin and 1.1 per cent. of ash.

Another gall very common in the neighbourhood of Philadelphia was collected in August from the twigs of the white oak, and identified as a *Dipterous* gall, made by some species of *Cecidomyia* or *Diplosis*. They were round, smooth, of waxy lustre, and much resembled very small apples, but were not quite so large as the Turkish galls. They were found to contain 73.19 per cent. of moisture, 0.46 per cent. of ash, and 9.3 per cent. of tannin. This corresponded to 34.8 per cent. of tannin and 1.7 per cent. of ash in the perfectly dry galls. Another gall also collected in August was obtained from the leaves of *Quercus palustris*, and stated by L. O. Howard to have been produced by *Holcaspis globulus*. They yield when fresh 3.9 per cent. of tannin, 0.77 per cent. of ash and 58.7 per cent. of moisture. This, when calculated without moisture, showed 9.5 per cent. of tannin, and 1.87 per cent. of ash. About the same time that these were collected, a few galls were found on the leaves of *Rhus glabra*, but the insect producing them was not identified. Unlike the oak galls, they were hollow, and in many other respects they resembled the commercial Chinese galls. They were somewhat pear-shaped, nearly as large as the Chinese variety, but were externally of a greenish colour, and became brown on drying. They were not assayed until they had become air dry, and were then found to contain 61.7 per cent. of tannin, 2.0 per cent. of ash and 12.9 per cent. of moisture, or for the absolutely dry material, 70.9 per cent. of tannin and 2.34 per cent. of ash.

Formation of Raphides in *Phytolacca Dioica*. G. Acqua. (*Ann Agron.*, xvi. 275.) The raphides so common in *Phytolacca dioica* are most numerous in the neighbourhood of the young shoots. There are no crystals in the embryo, but soon after germination they appear in the root cap, afterwards in the cotyledons; before their formation, the cells in which they are to appear are filled with gelatinous contents. If the young plants are grown in a nutritive solution containing no calcium, fresh crystals do not appear, but those already formed do not dissolve. Oxalic acid is formed in all the turgescient cells of the bark and pith; it unites with potash, and passes in solution through the intercellular spaces; in certain cells, distinguished by the nature of their contents, the calcium salts everywhere present precipitate the oxalate. Similar observations were made

with *Mesembryanthemum acinaciforme* and *Euonymus japonicus*. The oxalate always remains where it is formed.

Parasitical Plants. A. Chatin. (*American Druggist*, May 15, 1891.) The author proves that a parasite growing on plants of the *Strychnos* genus contains neither strychnine nor brucine. The mistletoe growing upon the oak does not contain the tannin of the latter, but exclusively a tannin striking green with iron. In like manner other parasites are shown not to absorb the peculiar principles of their hosts.

Ergot and its Preparations. R. Kobert. (*Chemist and Druggist*, October 18, 1890.) The author has made clinical and physiological experiments with the various constituents of ergot, which have been claimed as active principles. He arrives at the conclusion that cornutine is the most active constituent, and gives the following directions for its preparation:—The drug is exhausted by means of water acidulated with hydrochloric acid, the aqueous solution nearly neutralized by sodium carbonate, then evaporated in vacuo, at a very low temperature, to a syrupy consistence, and treated with 95 per cent. alcohol. The alcohol is removed from the liquid after filtration by careful distillation, and the nearly dry product is treated with anhydrous ether, which removes any ergotinine present. After making the residue alkaline with sodium carbonate, it is treated with acetic ether, and the solution of cornutine so obtained is shaken with water containing a little citric acid, which removes the cornutine in an almost pure state. This process is then repeated, and the cornutine dissolved in acetic ether, the solution concentrated, and finally the substance is precipitated in the pure state by means of anhydrous ether, which retains in solution any remaining traces of ergotin. Cornutine so prepared, will, if kept dry, and not exposed to light, remain unchanged. The author has kept some for three years without noticing any deterioration.

The author also criticises the various official and popular preparations of ergot. As regards the extracts of the different Pharmacopœias he thinks that the fluid extract, prepared according to the directions of the U. S. Pharmacopœia, approaches, when fresh, most nearly to the natural drug; and this was hitherto the only one made with a hydrochloric acid menstruum. But no matter how the extracts are made, they all agree in losing their activity in a short time. The author has examined a great number of them, and found that they became practically valueless in the course of nine months. Neither sterilizing nor the use of anti-

septics could protect a watery preparation from change, as this is due not only to fermentation and the presence of bacteria, but to independent chemical decomposition, partly of a nature of oxidation. He has also arrived at the conclusion that water is the worst solvent that can be used, as the active principles decompose in it very rapidly. In his opinion the only way to obtain a reliable extract containing the chief active principles cornutine and sphacelinic acid, is to treat powdered ergot with petroleum ether in order to remove the fatty oil, and then to exhaust with rectified spirit. This tincture is evaporated until 15 grains of it represent 150 grains of the ergot employed. The author's clinical experiments with many liquid extracts, including that of the British Pharmacopœia, and also with ergotin pills, gave unsatisfactory results. Hitherto ergotin has generally been made from aqueous infusions or percolates by precipitation of earthy phosphates and albumen with alcohol, and evaporation to the consistence of a pill mass. The author believes, however, that all such preparations are wrong in principle, and that an ergotin liable to the minimum amount of change must be made by the alcohol process from ergot not more than a year old and freshly powdered for use. He disagrees with the view expressed by J. Moss, that ergot freed from its oil by hydraulic pressure, retains its therapeutic properties for years. He admits that if the powder is kept absolutely free from water its activity may be preserved; but he prefers to keep the drug whole, in air-tight vessels, and perfectly dry.

Note on the Fruit of *Erythroxylon Coca*. C. J. H. Warden. (*Pharm. Journ.*, 3rd series, xxi. 1.) The drug used for the author's examination was collected from plants about two years old, grown in his garden at Alipore, near Calcutta. The fresh ripe fruit weighed, on an average, 158 gram each, was bright scarlet in colour, and possessed a distinctly sweetish taste; but though masticated at various times, no physiological action on the mucous membrane of the mouth was observed. By exposure to even a moderate degree of heat the bright red hue of the fresh ripe fruit was changed to dark brown; with partially ripe fruit the alteration in colour by heat was much less marked. Dried in vacuo over sulphuric acid the original tint was only slightly deepened, and this method of desiccation was employed in preparing the fruit for analysis, on account of the possible action of heat causing partial decomposition of any alkaloidal principle, which might be present. Dr. Dymock has furnished the author with the following description of the microscopic structure of this drug:—

From the outside towards the interior the fruit presents first a single row of brick-shaped cells forming the epidermis; within them is a single row of very large cells containing a mass of starch granules and scarlet colouring matter. Next comes the pulp, composed of parenchymatous cells, containing starch and granular matter. Next to this the shell, composed of an outer layer of stony cells, like bone cells, which are of considerable length; within this layer is a row of scalariform vessels, and then several rows of pitted vessels. Finally there is the almond, the cells of which are full of starch.

The author's proximate analysis of the fruit shows the following results:—

	Per cent.
<i>Moisture lost at 100° C. after partial desiccation over sulphuric acid</i>	5.423
<i>Ash</i>	4.271
<i>Petroleum ether extract, containing 3.021 per cent. of glycerides of fatty acids, and 1.519 per cent. of impure phytosterin (?), with colouring matter, etc.</i>	4.540
<i>Ether extract, soluble in petroleum ether .232 per cent., soluble in water, and containing cocaine .110 per cent., soluble in absolute alcohol .069 per cent., soluble in ether, but insoluble in petroleum ether, alcohol, or water .029 per cent.</i>	.440
<i>Absolute alcohol extract containing coccotannic acid and a trace of alkaloid . . .</i>	3.820
<i>Aqueous extract</i>	23.440

Toxicity of Corn Cockle Seeds. V. Lehmann and M. Mori. (*Ann. Agronom.*, xvi. 381–382.) Corn cockle seed has been long recognised as poisonous. It contains, albuminoids, 14.46; fat, 7.09; starch, 47.87; saponin, 6.56; cellulose, 8.23; ash, 3.97; water, 11.50 = 99.68. The saponin is the poisonous ingredient; apart from this, the seed is very nutritious. Fowls, pigeons, ducks, etc., die after eating these seeds; large doses are dangerous to cats, dogs, and pigs. Calves die after eighteen to twenty hours when given 6 to 7 grams per kilo. of their weight; they recover after 4 grams per kilo.; 3 to 5 grams of the flour produced symptoms of poisoning in the authors. The poisonous property is destroyed by baking or grilling the seed or flour in a stove; an aromatic odour is given off, and in the heated substance no saponin can be detected. One of the authors consumed 100 grams, the other 140

grams of the cooked flour in seventeen days, once as much as 35 grams in two days, without feeling the least ill effect.

Siberian Cedar Nuts. E. Lehmann. (*Pharm. Zeitschr. für Russland*, 1890, 257 and 273; *Amer. Journ. Pharm.*, August, 1890.) Siberian cedar nuts, the seeds of *Pinus Cembra*, attain a length of 11 mm. and a width of 9 mm., are ovate in shape, irregularly and obtusely triangular, have a brown-reddish, hard and brittle testa, a thin, brownish inner seed coat, and a milk-white oily kernel. The large parenchyma cells of the endosperm contain roundish aleuron granules and minute starch grains. The elongated embryo terminates in about eleven narrow cotyledons, forming a head and enclosing the plumule. The kernel weighing something over one-half of the seed, yielded 56 per cent. of fixed oil, 6 per cent. of albumen, 2.7 per cent. of sugar, 1.6 per cent. of starch, 9 per cent. of moisture, and 2.6 per cent. of ash. The fat contains myristicin, but consists chiefly of an olein which is probably identical with linolein.

Cubebs. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxi. 519.) The author publishes some information sent by Dr. Treub, Director of the Government Botanic Gardens in Java, respecting the keboe cubebs, of which a sample was presented to the Pharmaceutical Society's Museum a short time ago. In this it is stated that the cubebs referred to consist of the fruit of *Pothomorphe* [*Cubeba*] *mollissima*, but that the large blackish cubebs, with long stalks, and the false cubebs generally referred to *Piper crassipes* are probably not exported from Java, but from elsewhere.

Adulterated Mace. M. Hefelmann. (*Pharm. Zeit.*, 1891, 122. From *Amer. Journ. Pharm.*) The adulterations of powdered mace generally consist in the addition of Bombay mace or of other vegetable material (leguminous fruits) coloured with turmeric. The presence of the latter is revealed by the finding of starch-cells under the microscope, pure mace not containing starch. Bombay mace may be detected by boiling the suspected sample with alcohol and filtering through a white filter; in the case of pure mace the filter is stained a faint yellow, but in the presence of Bombay mace the filter, especially the edge, is coloured red. If the quantity of the adulterant is very small the coloration shows only after drying the filter. Another and more delicate test is to add basic acetate of lead to the alcoholic filtrate; with pure mace only a white turbidity is occasioned, but in the presence of Bombay mace a red turbidity or precipitate, dependent upon the quantity, is obtained. Turmeric will give a similar reaction, but the following test will

decide upon the presence of turmeric or Bombay mace; a strip of filtering paper is saturated with the alcoholic solution, the excess of liquid removed by pressing between filtering paper and the strip drawn through a cold saturated solution of boric acid; if the adulterant be Bombay mace the paper remains unchanged, while in the presence of turmeric the paper changes to orange or even brown. The subsequent addition of a drop of potassium hydrate solution to the strip causes a blue-coloured ring if turmeric be present, or a red ring in the presence of Bombay mace.

Constituents of Star-Anise Fruit. F. Oswald. (*Archiv Pharm.*, ccxxix. 84.) The author reports that the essential oil consists principally of anethol, together with a small quantity of terpenes, saffrol, a monoethyl ether of hydroquinone, anisic acid, and probably some complex compounds of the aromatic series, which upon oxidation yield veratric acid and piperonal. The fatty oil is described as containing, besides considerable quantities of glycerides, appreciable proportions of cholesterin and phosphoric acid compounds. No choline was found. The watery extract was found to contain protocatechuic and shikiminic acid, the latter differing in its formula from quinic acid by $-H_2O$. Sugar could not be detected in any notable quantity, the sweet taste being mainly referable to the essential oil. Nitrogenous bases proved to be absent.

Constituents of Melon Seeds. C. Forti. (*Chem. Centr.*, 1890, ii. 581-582.) The author found these seeds to contain cholesterin and a dextro-rotatory carbohydrate apparently belonging to the galactan group.

The oil yielded by the seeds to ether amounts to 49 per cent., and is almost free from fatty acids. It contains lecithin. The phosphorus amounts to about 0.02 per cent.

Lycopersicum Esculentum. G. Brosi and T. Gigli. (*Amer. Journ. Pharm.*, April, 1891.) The tomato fruit has been examined by the authors with reference to its constituents. On an average the fresh fruit contains:—Seeds 10.9 per cent., pulp 85.4 per cent. and skin 3.7 per cent. The pulp can be separated into a yellow juice and a red residue, which is tasteless after washing; the juice on an average has the specific gravity 1.0217 and contains levulose, citric acid (0.4 to 0.65 per cent. of the juice), albuminoids and mineral matters composed of 60 per cent. potassium salts. Minute traces of alkaloid are indicated; tartaric acid could not be detected. The red residue imparts its colouring matter to ether, alcohol, chloroform, and aqueous alkalis. The alcoholic solution

is not changed by ferric chloride, dilute acids or alkalies; on addition of strong nitric acid a transient blue colour is produced; the residue left on evaporating the alcoholic solution becomes blue by adding sulphuric acid. The colouring matter resembles that of saffron.

Constituents of Sabaiilla Seeds. E. Merck. (*Chem. Centr.*, 1891, i. 363.) The author's investigation of the seeds of *Asagraea officinalis* has led to the isolation of two alkaloidal principles, *sabadine* and *sabadinine*, answering respectively to the formulæ $C_{29}H_{51}NO_8$ and $C_{27}H_{45}NO_8$. Neither of these bases is precipitated from the solutions of its salts by alkalies without the application of heat.

Sabadine crystallizes from ether in short needles, and in the crystalline state is difficultly soluble in water and ether. The fusing point is $238-240^{\circ}C$., where decomposition takes place. On complete evaporation of the ethereal solution the last portions remain as an amorphous mass, which gradually crystallizes. Concentrated sulphuric acid dissolves the alkaloid with a yellow colour and a green fluorescence; this disappears as the liquid assumes a blood-red and then a violet colour.

Sabadinine crystallizes from ether in filiform needles, somewhat soluble in water and rather soluble in alcohol. At a higher temperature, decomposition takes place. Concentrated sulphuric acid dissolves the alkaloid with a blood-red colour which does not change.

Sabadine possesses marked sternutatory properties, while sabadinine does not.

Constituents of the Seeds of Cataputiæ Minoris. Y. Tahara. (*Ber. der deutsch. chem. Ges.*, xxiii. 3347-3351.) The seeds were carefully freed from oil and extracted repeatedly with alcohol; the alcohol was evaporated, the residue washed with ether, and boiled with alcohol; on cooling the solution, brown crystals of ausculetol deposited, which were purified by treatment with lead acetate. On allowing to remain for some time in a closed flask, a substance separated which could be crystallized from alcohol in colourless, odourless prisms melting at 193° ; it was found to be insoluble in water, alkalies, or acids, and has not yet been further investigated.

Delphinium Staphisagria. M. Charalampi. (*Journ. de Pharm. et de Chin.* [5], xxiii. 302-306.) The author has extracted the alkaloids from the seeds of this plant, and finds the formula of delphinine to be $C_{62}H_{49}NO_{14}$, and that of delphinidine, $C_{50}H_{42}NO_8$.

The mother liquor left after the extraction of the delphinine was found to contain an alkaloid of the composition $C_{62}H_{50}N O_{14}$, which the author describes under the name of *delphisine*. Delphinine, delphisine, and delphinoidine, especially the two former, are highly poisonous, resembling aconitine in their action. The closest relation to aconite is shown by delphinine, but the lethal dose for cats and dogs is 1.5 and 0.7 milligram respectively for the two crystalline delphinium alkaloids. Delphinoidine has a more decided narcotic action, the lethal dose being 5 milligrams.

The author has also examined the product previously described as staphisagrine, and arrives at the conclusion that it consists of a mixture of four amorphous alkaloids.

Assay of Colchicum Seeds. A. Kremel. (*Zeitschr. für analyt. Chem.*, xxix. 727.) 20 grams of the seeds are extracted by percolation with 90 per cent. alcohol. The united percolates are mixed with 25 c.c. of water and evaporated on the water-bath. The aqueous residue is filtered, and then four times shaken with 10–15 c.c. of chloroform. The residue left on evaporating the chloroform is dissolved in water, filtered, and again extracted with chloroform. The residue from the second chloroform solution is heated on the water-bath with a few c.c. of water to decompose a compound of colchicine with chloroform, then evaporated, and finally dried over sulphuric acid to a constant weight.

The Arrow Poison of the Pigmies. Surgeon Parke and E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxi. 917–922.) The arrow poison used by the pigmy race in Central Africa is of a very fatal character. Of all the men wounded by poisoned arrows at the action of Ava-Sheba, only one survived, and his recovery was probably due to the fact that the poison was immediately sucked from the wound.

Five plants are employed to make the poison. Of these one of the authors (Surgeon Parke) brought home such portions as he was able to procure at the time. They consist of (1) a bark, (2) a large green leaf, (3) a thorny creeper, (4) a green stem, (5) a bean-like seed. He gives a detailed description of each one of these parts, and supplies the following information respecting the preparation of the poison:—

The large leaves, the bark, the pink thorny stem, and the scrapings of the green stem, and four of the small seeds are all pounded together into a paste, which is stuck on the top of the arrow and allowed to dry. At first it is of a greenish colour but becomes paler, and forms a hard crust like clay on the arrow.

A detailed description is given of the symptoms produced by this poison; but it may suffice in this place to say that the leading symptom is tetanus.

Following this comes a description of the antidote used by the pigmies, which is prepared from parts of three plants and a white powder. Two of the vegetable parts are leaves, while the third consists of leaves and scrapings of young branches.

For a description of these leaves as well as those composing the poison, and the wood-cut illustrations accompanying both, reference should be made to the original paper.

E. M. Holmes has undertaken the identification of the material, both of the poison and the antidote. Dealing in the first place with the former, he refers the bark to *Erythrophloeum Guineense*, and the large green leaf to a commelynaceous plant probably *Palisota Barteri*. The bark is also known as Sassy bark. The thorny creeper he finds to be derived from a species of *Combretum*, but in the absence of leaves the precise species could not be ascertained. The green stem was recognised as the stem of a species of *Strychnos*, probably *S. Icaja*. The author considers it likely, therefore, that the tetanic symptoms which were observed, may have been due to the action of strychnine, and which may have been absorbed more slowly than the Sassy poison. The seeds were found to agree well with those of *Tephrosia Vogelii*, a well-known African species supposed to possess narcotic properties.

The foregoing results justify the conclusion that the chief active ingredients in this arrow poison are erythrophloeine and strychnine.

As regards the "antidote," the white powder forming one of the three constituents has proved on analysis to consist simply of wood ashes. Of the three plants employed only leaves and stem were available for examination, and did not possess any very definite distinctive characters, with the exception of No. 1, the leaves of which seemed to belong to a species of *Unona* and to approach closely to *U. lucidula*. The plants of the *Anonaceæ* are chiefly remarkable for aromatic and stimulant properties. The second and third plant of which this antidote is composed remain for the present unidentified.

Physiological Action of Curare. J. Tillie. (*Journ. Anat. and Physiol.*, xxv. 42.) The author shows by experiments on animals that subcutaneous injection of the alkaloid curarine causes a marked fall in the blood pressure, and produces a paralysing action on the

motor nerves, while curine paralyses the heart's action, but exercises no appreciable effect on the motor nerves. He points out that the variable action of different samples of curare which has been observed is to be attributed to differences in the relative proportion of the two alkaloids, and that the curare of commerce will vary in its composition according to the district in which it is prepared, and the species of strychnos employed.

Physiological Action of Curare. W. Nikolski and J. Dogiel. (*Pflüger's Archiv*, xlvii. 68-115. From *Journ. Chem. Soc.*) The curare which reaches Europe is of different strengths; in many samples, calcium carbonate and phosphoric acid are present, and the preparations called "curarine" or "curarine sulphate" are by no means pure. The poison is not absorbed through the skin at all, and only with difficulty through mucous membranes; injected, however, under the skin or into the blood its effects are at once noticeable. Curare acts on the central nervous system, the ends of motor nerves in voluntary muscles, and in the cardiac and plain muscles, and it also produces changes in the muscular tissues.

The point of injection makes considerable difference as to which part of the body is first affected. If the injection be made into the carotid artery, the cerebrum is affected first; if into a limb artery, paralysis of that limb is the first phenomenon produced.

The motor nerve endings are not all paralysed equally; thus plain muscles resist its action longest, and among voluntary muscles there are also differences found. Among different animals varying results are obtained; for instance, the drug acts less powerfully on the vasomotor centre of rabbits and cats than dogs; applied to the conjunctiva of mammals, the pupil is not dilated, whereas in birds it is; atropine, on the other hand, produces pupillary enlargement in mammals, and not in birds. But if curare is injected into the circulation, the pupil of mammals is slightly widened. The action is thus probably not due to paralysis of the motor nerve endings in the *sphincter pupillæ*, but to some effect in the central nervous system.

The weakening or abolition of vagus influence on the heart is caused by smaller doses of curare in cats than in dogs and rabbits; the paralysis of the vagus endings in stomach and intestine occurs later, but unequally so in the three mammals mentioned.

The ultimate cause of the physiological action of curare is, doubtless, an alteration in the protoplasm of muscle and nerve, but this is not simultaneous nor equally great in the two tissues.

By washing out the curare from the voluntary muscles, paralysis passes off. There is a corresponding return of movements after irrigation in amœbæ and lymph corpuscles the activity of which has been stopped by curare.

Death in curare-poisoning in mammals is due to the effect of the drug on the respiratory centre, rather than on the motor nerve endings in the respiratory muscles. Curare subjected to the action of ozone loses its usual effects on the animal organism.

Antidote to the Poison of the Rattlesnake. F. D. Kelsey. (*Pharm. Journ.*, 3rd series, xxi. 986.) The author states that a native plant of Oregon and Montana, *Hieracium Scouleri*, has been successfully used in that region as a safe and sure cure for rattlesnake bite. The plant is taken up whole and fresh, though he believes it can be made into a pharmaceutical preparation, such as a powder, or a decoction, or an extract. The plant is bruised and washed, and then gently steeped in milk. This, after straining, is to be drunk in large quantities; and it is stated that several patients who have been thus treated have all recovered. An allied species, *Hieracium venosum*, L., is known in the United States as "rattlesnake weed," and it is stated to be a well-known fact that deer, antelopes and other animals, when bitten by rattlesnakes, seek relief in eating some weed known to the hunters in early days.

Hungarian Opium. A. Deir. (*Pharm. Rundschau*, 1891, 67.) From 340 capsules the author obtained 16 grains of dry opium in the form of a light brown brittle mass resembling lactucarium, having the characteristic odour of opium in a marked degree. The perfectly dry substance contained 16 per cent. of morphine, associated with narcotine, codeine, narceine, thebaine and meconic acid.

Assay of Opium. E. Dieterich. (*Pharm. Centralhalle*, xxxi. 591.) Six grams of the finely powdered opium are rubbed up with 6 c.c. of water, rinsed into a tared flask, made up with water to a total weight of 54 grams, shaken for fifteen minutes, and poured on to a ribbed filter of 10 cm. diameter. 42 grams of the filtrate are mixed with 2 c.c. of dilute ammonia (17 grams of concentrated ammonia to 83 grams of water), avoiding shaking, and the mixture is immediately poured through a ribbed filter. 36 grams of this filtrate are then mixed, in an accurately weighed flask, with 10 grams of ethyl acetate and 4 grams of the above dilute ammonia, and, after corking the flask, the mixture is shaken vigorously for ten minutes. Another 10 grams of the ether are added, and the ethereal layer is poured off as completely as possible; and this treatment is repeated a second time. The liquid is then poured

through a plain 8 cm. filter, and flask and filter are twice rinsed with 5 grams of water saturated with acetic ether. After thorough draining and drying at 100°, the contents of the filter are added to those of the flask, and the drying is completed.

Short Methods for Assaying Opium and its Galenical Preparations. J. B. Nagelvoort. (*Amer. Journ. Pharm.*, November, 1890.) The author strongly recommends the following modification of Flückiger's process:—Dry 10 grams of crude opium in a porcelain dish at 100° C., for three hours, transfer to a dry mortar and pulverize. Put the powder, guarding against loss, into a filter of 2 inches diameter, pour slowly over the powder a mixture of 10 c.c. of ether and 10 c.c. of chloroform, cover well, and after the liquid has drained off, add 10 c.c. of chloroform. Drain the liquid, spread out the filter and dry its contents; then carefully transfer the washed and dried opium to a vial holding about 120 c.c.; add 100 c.c. of water; cork and frequently shake the vial during two hours. Now filter off 50 c.c. into a small bottle, shake with a mixture of 10 c.c. of alcohol of 94 per cent., 20 c.c. of pure ether, and 1 c.c. of ammonia water of 10 per cent., and allow to stand for six hours. Collect the morphine on a tared filter, wash with as little cold water as possible, or with a saturated solution of morphine, press the filter between blotting-paper, afterwards dry at 100° to constant weight, and weigh between watch glasses. The weight multiplied by twenty gives the percentage of pure morphine.

For the sampling of opium the author suggests the following procedure:—Take, with a knife, a small piece from the inside of every lump in the lot, mix these pieces together, take 10 grams for the moisture determination, dry the remainder, pulverize, and then take from this homogenous mixture of the powders, 5 grams for another moisture determination, and 10 grams for the determination of morphine. Calculate the percentage of morphine in the crude opium, taking into consideration the amount of moisture contained therein less the moisture contained in the powder.

The author considers that Flückiger's process modified properly for galenical preparations of opium will be appreciated by analysts as a very expeditious one. The short time in which crystallization is effected, is decidedly in favour of obtaining pure morphine, while processes with slow crystallization yield the alkaloid impure. In the author's opinion a dilute solution and the least possible quantity of ammonia is to be preferred to a concentrated solution and an excess of ammonia as used in other processes of opium-

assaying. In the case of *vinum opii*, the acidity of the wine has to regulate the amount of ammonia, which must be slightly in excess. 2 c.c. were generally found to answer the purpose.

Constituents of Manna from *Eucalyptus Gunnii*. F. W. Passmore. (*Pharm. Journ.*, 3rd series, xxi. 717-719.) The author reports upon a specimen of manna from *Eucalyptus Gunnii*, which had been forwarded to the Research Laboratory of the Pharmaceutical Society by J. H. Maiden, Curator of the Technological Museum, N.S.W. The manna was collected on the 27th and 28th March, 1890, near Woollandibby, Jindabyne, N.S.W., from trees of 2-4 feet diameter and from 40-60 feet high, known in that locality as "white gum" trees. The specimen consisted of a dirty white, semi-crystalline substance, in the form of small nodules, mixed with a small quantity of matter of evidently extraneous origin, and possessed a sweet aromatic taste and odour suggestive of eucalyptus oil. The saccharine constituent or constituents dissolved readily in water, and to an appreciable extent in absolute alcohol. The filtered aqueous solution reduced Fehling's reagent strongly upon warming and also gave a precipitate, though of unpromising character, when heated for ten minutes upon a water-bath with acetate of phenylhydrazine, thus suggesting the presence of sugar contaminated with substances of a gummy or resinous nature. The principal constituent, when isolated in a perfectly pure condition, exercised, however, no reducing action upon Fehling's solution, and did not react with phenylhydrazine, thus resembling the mannite of the ash-manna. But after boiling for a few minutes with a dilute mineral acid, the neutralized solution caused a copious precipitate of cuprous oxide, and yielded almost immediately, upon addition of acetate of phenylhydrazine and warming, a yellow precipitate of an osazone melting at a temperature considerably below the melting-point of phenylglucosazone (205°). The latter observation proved that the body under examination did not belong to the series of polyatomic alcohols of which mannitol is the type, but that it was probably either a glucoside or else possessed a constitution analogous to that of cane-sugar, resulting from the condensation of two or more molecules of a glucose with elimination of water. The author gives full details of his chemical examination of this saccharine constituent, showing that the characteristic sugar of the manna from *E. Gunnii* is melitriose, which consists of a condensation product of equal molecules of galactose, glucose, and fructose. The nature of the combination is not yet perfectly understood, although Scheibler

and Mittelmeier suggest that the connection between the glucose and galactose residues is probably identical with that in milk-sugar.

Curaçoa Aloes. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxi. 205.) The author reports upon specimens of the leaves and flowers of the aloe from which Curaçoa aloes is prepared, the specimens having been received from D. F. van Eeden, of Haarlem. The same specimens have also been examined by J. G. Baker, who refers the plant without hesitation to *Aloe chinensis*, Baker, which he regards as closely allied to but yet specifically distinct from *A. vera*, L. (*A. barbadensis*, Mill.). To this the author of the present paper adds that if it can be shown that the plant cultivated in Barbadoes is the true *Aloe barbadensis*, Mill., the specific difference might go far towards explaining the characteristic odour and appearance of Curaçoa aloes as compared with the Barbadoes aloes of commerce. *A. vera*, L. (*A. barbadensis*, Mill.), is a native of the Mediterranean region, although now widely disseminated in the warmer regions of the globe, and there is a variety of it, *littoralis*, Kœnig, found on the southern shores of Eastern India, which is stated in Baker's monograph (*Journ. Lin. Soc.*, xlviii. 176) to come near to *A. chinensis*, Baker. In the absence of more definite information, the author assumes that the *Aloe chinensis* cultivated in Curaçoa was probably carried there from the Dutch East Indies.

The two specimens received by the author from D. F. van Eeden proved to differ slightly from the description given of *A. chinensis* by Baker, in the following particulars:—The leaves show a purplish colour (due possibly to the action of the spirit employed to preserve them). The anthers (but not the filaments) are exserted. Each of the segments of the perianth have three purplish lines extending from base to apex. The three outer segments are somewhat acute, and the inner distinctly obtuse.

The author gives various reasons for supposing that *A. chinensis* may possibly be found to be a native of the coast of Africa, Arabia, or India. In connection with this subject he expresses a hope that Indian botanists will endeavour to clear up the mystery still surrounding the botanical source of the aloes produced on the shores of N.E. Africa, Arabia, and India.

Notes on Natal Aloes. J. M. Wood. (*Kew Bulletin*, August, 1890.) The author has visited the neighbourhood of Greytown, and has satisfied himself that the chief botanical source of Natal aloes is *Aloe ferox*. He gives an interesting account of the

manner in which the juice is collected and inspissated, for particulars of which we refer the reader to the original paper in the source above quoted, or to a reprint of it in the *Pharmaceutical Journal*, December 6, 1890, 495 and 496.

Natal Aloes. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxi. 898-899.) There has for many years been a difficulty in determining the botanical source of the article known in commerce as "Natal," or sometimes as "Hepatic" Cape aloes.

In appearance the drug bears a strong resemblance in colour and opacity to true Hepatic aloes, but differs from it in four particulars, (1) in odour, which resembles that of Cape aloes; (2) in the colour of the powder, which has a greenish brown, not yellowish brown tint; (3) in the chemical reaction with nitric acid; and (4) in the fact that it yields a distinct aloin.

An investigation conducted at the author's request by Messrs. Bainbridge and Morrow a short time ago (*Year Book of Pharmacy*, 1890), led to the conclusion that *Aloe succotrina* alone, of all the leaves examined, was the most likely source of the Natal aloes of commerce. More recently the author succeeded in obtaining a specimen of aloes prepared in Natal from Mr. J. M. Wood. This specimen, however, resembled Cape aloes in its translucent appearance, and not Natal aloes. When chemically examined by Mr. Bainbridge, it was, however, found to agree with the opaque Natal aloes and with the juice of *Aloe succotrina*, in its chemical reactions. The same chemist also undertook comparative experiments with some aloes and aloes juice obtained from plants growing near Port Elizabeth. These had been obtained by the author in 1885 together with the living plant. The latter when compared at Kew with the living specimens in the collection there, appeared to agree fairly well as regards the leaf with *Aloe platylepis*. The results of Mr. Bainbridge's examination (see succeeding abstract) showed that this aloes corresponds with the Cape aloes, and not with that known as Natal. Some of the juice which was carefully evaporated in a water-bath soon after its arrival yielded a *translucent* aloes.

The identity in chemical reactions between the translucent Natal aloes above alluded to, and opaque or Hepatic Natal aloes, induces the author to infer that the aloes known in English commerce as Natal, or Hepatic Cape aloes, is the product either of *Aloe succotrina* or some species the juice of which gives the same chemical reaction, and that its opacity is probably due to some peculiarity in the mode of manufacture. He also considers it probable that

different species are used in different districts in Natal, and that no botanist has yet seen the opaque aloes manufactured.

Examination of Specimens of South African Aloes. J. Bainbridge. (*Pharm. Journ.*, 3rd series, xxi. 899.) The author received from Mr. Holmes the following specimens of aloes and aloes juice for examination: (1) a small sample of the aloes from Natal, sent to Kew by Mr. J. M. Wood; (2) aloes prepared from a South African species, and believed by Mr. E. M. Holmes to be *Aloe platylepis*, or an undescribed species closely allied to it; (3) some juice of the last-named which had been in the Pharmaceutical Society's Museum since 1885.

Perfectly identical results were obtained between the specimens of *A. ferox*, obtained from Mr. Wood, and the large number of commercial specimens of Natal aloes that had been previously examined. In comparison with the aloes obtained from plants grown at Kew, the author finds that it resembles most closely in its reactions those obtained from *A. succotrina*. The only reaction in which they do not agree is the bromine test, but this reaction is not considered as a proof that the commercial Natal aloes are not derived from this species, but that it is possible that the property might be lost on keeping or by fermentation. The reactions of the aloes from the plant supposed to be *A. platylepis* are similar to those of commercial Cape aloes.

The results are recorded in the following table:—

Specimens.	HNO ₃ .	H ₂ SO ₄ and vapour of HNO ₃ .	Cripps and Dymond.	C and D. with NH ₄ HO.	Bromine test.	Fe ₂ Cl ₃ .
Natal aloes, from " <i>A. ferox</i> , J. M. Wood .	Permanent crimson.	Blue.	Deep crimson.	Intense brown-red.	No effect.	Olive-green.
<i>A. ferox</i> , grown at Kew	Evanescent crimson.	Green.	Pale yellow.	Red.	Violet.	Olive-green.
Commercial Natal aloes	Permanent crimson.	Blue.	Deep crimson.	Intense brown-red.	No effect.	Olive-green.
<i>A. succotrina</i> , grown at Kew	Permanent crimson.	Deep Blue.	Crimson.	Intense brown-red.	Deep purplish-red.	Olive-green.
Aloes prepared from <i>A. platylepis</i> , grown near Port Elizabeth	Green after standing a few minutes.	Nil.	Orange-red.	Pale claret.	Nil.	Olive-green.
Juice of <i>A. Platylepis</i>	Beautiful emerald-green.	Nil.	Orange-red.	Pale claret.	Nil.	Olive-green.

The Aloïns. F. X. Moerk. (*Amer. Journ. Pharm.*, June, 1891.) According to researches of Groenewold the aloïns from Barbadoes and Curaçao aloes melt at 140° C. and probably have the formula $C_{16}H_{16}O_7$; the aloïn from *Aloe hepatica* Natal melts at 210° C. (with decomposition) and has the probable formula $C_{24}H_{26}O_{10}$. G. Balster finds that the first two mentioned aloïns are reliable laxatives, administered either in pill form (with extract of liquorice) or by subcutaneous injections (in formamide solution). Nataloïn administered to dogs and cats is not reliable unless given in disproportionately large doses; with the addition of alkalies, however, small doses will suffice. Administered to man, natalin, even with alkalies, is inactive except in such cases where only a meat diet is followed. Aloïn is always eliminated with the fæces, seldom with the urine.

For the detection of aloïn, Klunge's cupraloïn reaction or a new piperidine test was used; the latter test will also distinguish between barbaloïn and nataloïn. The addition of a drop of piperidine to a nataloïn solution produces a violet-red to a deep blue colour, depending upon the quantity of nataloïn; barbaloïn in the same manner produces only a yellow colour, by acidifying with acetic acid and agitation with acetic ether the latter will remove the yellow colouring matter (unchanged aloïn), while the aqueous solution will show the violet-red colour. These two tests succeed with 0.001 per cent. of nataloïn and 0.01 per cent. of barbaloïn.

Macrozamia (Encephalartos) Gum. H. J. Maiden. (*Pharm. Journ.*, 3rd series, xxi. 7.) The gums examined by the author were from *Macrozamia Perowskiana*, Miq. (*B. Fl.*, vi. 253). Syn. *E. Denisonii*, F. v. M. (*Cens.*), and *M. spiralis*, Miq. (*B. Fl.*, vi. 251). Syn.: *E. spiralis*, Lehm. (*Cens.*).

Macrozamia Perowskiana. Found in New South Wales and Queensland. In flattened pieces, reminding strongly of "button lac," but much lighter in colour even than the fine button lac of commerce. The flattened shape of the gum is due to the mode of collecting it. Every cone exudes more or less from the peduncle when freshly cut. The specimen was obtained by cutting off a large cone and allowing it to drain on a plate. The fruit stalk appears to be the part of the plant richest in gum, but only a small quantity flows from each stalk. This gum breaks readily, has a bright fracture, and feels horny in the mouth. If a piece be placed in cold water it begins to swell immediately, and this absorption of water goes on from two to four days, by the end of which period it has swelled to more than 100 times its original

size. It then presents the appearance of an almost colourless, quivering jelly, which is more bulky than that yielded by any other gum known to the writer. When the absorption of water is complete, it is so transparent that it can hardly, if at all, be seen in a beaker of water, and has to be felt for with a glass rod. The jelly assumes a pseudo-crystalline appearance, forming angular masses, coherent for the most part. This result is the consequence of the minute fissures in the dried gum. If the gum be previously heated to 100° C. for a few days, it loses much of its gelatinizing property, breaking up into very small fragments in cold water, like starch grains, instead of forming enormous angular pieces of jelly as before.

Analysis.

Arabin	94
Metarabin	77.22
Sugar	1.02
Water	14.81
Ash	6.66

Macrozamia Spiralis. Found in New South Wales and Queensland. In regard to this species commonly known as "Burrawang," the head of the plant was cut off, when in a few days the gum collected in a cup-shaped cavity left in the stem. When gathered it was soft, but firm enough to be picked up by the fingers; it, however, soon got softer in the vessel, something like the consistence of honey, a brisk fermentation commenced and lasted a few days, during which time the gum commenced to clarify itself. On drying, an inferior sample of gum was obtained, which is for the most part in scaly pieces, reminding strongly of gelatine before it has been bleached and purified. The pure article only (next described) was used for analysis. It was obtained on visiting the plants a few days after they had been subjected to the operation referred to. It forms small pear-shaped masses, the colour of which is much the same as that of *M. Perowskiana*, and, like this, it swells to an enormous extent when placed in water. It is brittle. Specific gravity, 1.524.

Analysis.

Arabin	1.07
Metarabin	71.7
Sugar	1.1
Water	21.71
Ash	4.72

In the author's opinion there is no commercial future before

macrozamia gum. Even when the insoluble metarabic gums shall have been converted into the soluble Arabic gums on a commercial scale, the supply will be obtained from various species of *Acacia*, which yield it in far greater abundance.

The fact that the insoluble portion of macrozamia gum has been referred to by C. R. Blackett as bassorin instead of metarabin has induced the author to consider at some length the question as to the exact meaning of the term bassorin, and as to the existence of such a body distinct from metarabin. After copious references to numerous authorities, he arrives at the conclusion that its existence is very doubtful. His own view respecting the nature of macrozamia gum is based on the following observations. Those acacias which are only partially soluble in cold water yield metarabin or cerasin, which swells largely in water, forming a smooth jelly, in no way differing from the insoluble portion of cherry gum, which is the original source of cerasin (metarabin). The gum of the black wattle (*Acacia decurrens*) was taken and compared with cherry gum in every possible way, and proved to be identical with it in properties and appearance. Further, macrozamia gum behaves like cherry gum, the only difference being that the former makes a bulkier jelly. Otherwise they are evidently the same gum. But tragacanth is a totally different substance. In external appearance, behaviour in water, and chemical deportment it is quite different to macrozamia gum or cherry gum. *The only point of similarity between macrozamia gum and tragacanth consists in their both swelling in cold water.* They both also yield some soluble gum, but of different composition. On long continued boiling in water macrozamia gum and cherry gum go into solution, the swollen portion being converted into arabin, the presence of which may be proved by acidulating with hydrochloric acid, and precipitating with alcohol. This precipitate can be washed with alcohol, dissolved in cold water, again precipitated by alcohol, and thus rendered pure. This is not the case with tragacanth, which, although dissolving on prolonged boiling in water, does not yield any arabin. The author's experiments in this latter respect confirm those of Giraud. One point to be remembered in repeating these experiments is that both macrozamia and cherry gum contain a little arabin, which is dissolved out by cold water. The only way to remove this soluble gum is by prolonged treatment with the filter-pump, as the arabin clings with great pertinacity to the bulky jelly formed at the same time.

The author's observations all support the conclusion that the portion of macrozamia gum insoluble in cold water is metarabin according to the generally accepted meaning of this word. He deprecates the use of the word bassorin at present, either to denote a distinct substance, or a synonym of metarabin.

Tragacanth. L. Reuter. (*Apotheker Zeitung*, 1890, 644.) The German Pharmacopœia requires that mucilage of tragacanth (1:50) should assume a yellow colour with solution of soda. This coloration is not produced in the cold, but develops rapidly on heating the mixture in a water-bath for a very short time. The author finds that when tragacanth is extracted with alcohol of more than 90 per cent. strength, the latter, upon evaporation, yields a yellow residue containing fat, a bitter principle, and a variety of sugar. The colour of this residue does not deepen on the addition of solution of sodium hydrate. After this treatment with alcohol the residual tragacanth acts towards soda solution in exactly the same manner as before this treatment.

Observations on the Gums yielded by two Species of *Ceratopetalum*. J. H. Maiden. (*Proc. Linn. Soc., N.S.W.*; *Pharm. Journ.*, 3rd series, xxi. 742). The genus *Ceratopetalum* belongs to the natural order *Saxifragæ* and is endemic in New South Wales. Of its two species the first is *C. gummiferum*, generally of bushy size, though in favourable localities it attains the dignity of a small tree. It is the well-known "Christmas-bush" of Sydney, and its reddish persistent calyx is very showy. For this reason it was also called "officer-plant" in the early days of the colony, though an officer's tunic is of a very different colour. The second species is a well-known gully tree, never found out of moist situations, and is tall, with smoothish bark, bright-looking foliage and white flowers which it bears in abundance. This is *C. apetalum*, and its local names are "coachwood," "lightwood," and "leatherjacket."

The first parcel of *C. gummiferum* gum received by the author was in small tears of a beautiful ruby colour, perfectly transparent, and having a bright fracture. It was powerfully astringent to the taste, sticking to the teeth, and obviously contained a large proportion of gummy matter. It was removed from the cut ends of a log, from which it exuded in small drops and in thin pieces which dried very quickly. The tree was 6 to 9 inches in diameter.

The author also received a cake of the substance obtained by draining the ends of a severed log on to a plate. When first

received it was exceedingly tough; but on exposure to the air for two or three months it fractured without difficulty between the fingers. The fractures were quite bright. It had no odour. To cold water it imparted a dark, rich orange-brown colour; at the same time the insoluble portion formed a bulky gelatinous mass.

In bulk the gum of *C. apetalum* appeared in no way different from that of *C. gummiferum*. It, however, smelt more or less strongly of coumarin, which was also contained in abundance in the bark. In cold water it swelled up largely, and at the same time possessed a good deal of coherence. It imparted to the water a pale orange-brown colour and an intense odour of coumarin.

Ceratopetalum gums appear to form a characteristic group, occupying an intermediate position between the kinos and metabarabic gums. The author considers *C. apetalum* as worthy of note as an available source of coumarin, and states that the presence of that substance sharply separates the two gums. The following difference also appears to be constant. The ash of *C. gummiferum* is quite white, while that of *C. apetalum* is dark brown, very bulky, and difficult to ignite. It contains but a small percentage of iron, but manganese is abundant. The composition of the gums is shown in the following table:—

	<i>C. gummiferum.</i>	<i>C. apetalum.</i>
Tannic acid, estimated as gallo-tannic acid.	16.76	6.85
Phlobaphenes (soluble in alcohol)	19.5	12.21
Phlobaphenes (insoluble in alcohol, together with metarabin)	41.6	52.09
Coumarin	nil (variable)	2 to 3
Accidental impurity	2.5	2.0
Moisture	16.7	20.47
Ash	1.8	3.44
	98.86	99.56

The author offers the following remarks on this table:—

Ceratopetalum gums yield, on treatment with cold water, a residue which consists almost entirely of phlobaphenes and metabarabin. That the greater portion of it consists of phlobaphenes is proved by the facility with which continued boiling with water converts it into an equal weight of tannic acid. If the gums of

this genus were boiled with water to begin with, the percentage of tannic acid returned would be between 40 and 50 per cent. in each case. (Actual experiments gave *C. gummiferum*, 49.78; *C. apetalum*, 41.14).

From his experiments in converting the phlobaphenes into tannic acid, the metarabin into arabin, and by observing the physical appearance in water and in alcohol of the original mixture, and other tentative methods, the author estimates the percentage of metarabin to be about 8 to 10 per cent. in each case.

The Gum of the Leopard-Tree, *Flindersia Maculosa*. J. H. Maiden. (*Pharm. Journ.*, 3rd series, xxi. 540). *Flindersia maculosa* belongs to the natural order *Meliaceæ*. It is an interior species, and is found in New South Wales and Queensland. Owing to the peculiar, and somewhat ornamental, spotted or blotched appearance of its bark, it is known as "spotted, or leopard tree." It also bears the name of "dogwood." During the summer months large masses of a clear amber colour exude from the stem and branches. It makes good adhesive mucilage, has a pleasant taste, and is eaten by the aborigines. It is commonly used by bushmen as a remedy in diarrhœa.

The author gives a description of two samples of the gum, and also the results of analyses, from which he draws the conclusion that the gum of the leopard tree is, to all intents and purposes, a good gum-arabic. The analytical results are as follows:—

Sample.	Arabin.	Metarabin.	Water.	Ash.	Total.
1.	80.2	nil.	16.49	2.76	99.45
2.	80.08.	nil.	16.4	2.63	99.11

Grass-Tree Gum. J. H. Maiden. (*Pharm. Journ.*, 3rd series, xxi. 902-906). Grass-tree "gum" is the produce of various species of *Xanthorrhœa*. There are twelve species of this genus, which belongs to the *Liliaceæ*, and several (perhaps all) exude resin from the caudex. A synonym of one or more species is *Acaroides resinifera*.

After dealing with the history, mode of collection and commerce of this drug, the author describes the following species of *Xanthorrhœa*, together with their resinous products:—*Xanthorrhœa hastilis*, which is the principal species yielding this "gum"; *X. arborea*, *X. australis*, *X. preissii*, and *X. tateana*.

The medicinal properties of *Xanthorrhœa* resins do not appear to be very well-marked. They have been employed in the form of tincture with opium in fluxus hepaticus and the colliquative

diarrhœa of phthisis, and have been recommended in chronic catarrhs. They have been repeatedly suggested as possessing some value in perfumery, but they are inferior for this purpose to benzoin, storax, and the balsams of Peru and tolu. Abundance of picric acid can be obtained from grass-tree "gum." But the fact that this substance can now be so cheaply made from coal-tar greatly detracts from the value of the "gum" in this respect. As a substitute for shellac in polishes it has not met with much favour.

Constituents of Commercial Asafœtida. W. A. Puckner. (*Proc. Amer. Pharm. Association*, 1890.) As the statements published respecting the constituents of *asafœtida* are rather conflicting, and especially so with regard to the proportion and composition of the ash, the author has re-investigated the subject. The method adopted was the following. A weighed quantity of a representative sample of the drug was dried in an air-bath until it could be reduced to a fine powder: the loss of weight was noted, and 2 or 3 grams, calculated to weight of the original sample taken for analysis. This was first extracted with alcohol in a Soxhlet extractor, and from the requirement of the U.S.P., that 60 per cent. should be soluble in alcohol, the loss under this treatment was noted. As the substance, after extraction, was dried at 100° C. and then weighed, the figures given in this paper give the amount soluble in alcohol plus the water contained in the original sample. The residue from alcohol extraction was then slowly ignited in a shallow platinum capsule, and this residue designated as ash.

The ash obtained was not a fixed quantity, as the organic matter present reduced a portion of the calcium sulphate to the sulphide. The ash was treated with hydrochloric acid and water, the residue again ignited and weighed as "insoluble ash." In the soluble portion alumina and iron were determined as oxides, calcium was precipitated as oxalate, dried in a Gooch filter at 100° C. and calculated as $\text{Ca C}_2\text{O}_4 (\text{H}_2\text{O})$, and magnesium determined as pyrophosphate. Carbonic acid was determined by Rose's method (absorption by caustic alkali). Sulphuric acid was determined by extracting a fresh portion with alcohol, treating the residue with dilute hydrochloric acid, evaporating, and treating with HCl and K Cl O_3 , to destroy organic matter, then precipitating with barium chloride. The barium sulphate was separated with a Gooch filter, dried at 130°–140° C. and weighed.

The following were the results obtained :—

	Soluble in Alcohol.	Total Ash.	Insol- uble Ash (earth, clay, sand, etc.).	Alu- mina and Iron.	CaO.	MgO.	SO ₂ .	CO ₂ .
No. 1 in mass . .	59.49	19.45	2.32	1.16	7.12	1.14	8.57	1.09
No. 2 " "	27.89	56.03	1.37	.42	25.07	2.03	20.49	10.78
No. 3 powdered .	44.48	38.59	2.36	.68	16.57	1.39	16.18	5.32
No. 4 " "	33.47	47.86	1.95	.60	18.85	.42	23.51	2.62
No. 5 " "	31.35	55.38	21.96	2.57	9.91	6.49	8.96	4.25

Silica—not determined.

Assay of Scammony. P. Boa. (*Chemist and Druggist*, November 15, 1890.) In assaying scammony by the B.P. test of a certain percentage being soluble in ether, the author has observed that in drying the ethereal extract the weight may become constant before the extract is really dry. This is due to the varnishy nature of the extract, which includes some of the solvent even after prolonged heating on a water-bath. The possible error may be from 1 to 3.75 per cent. He recommends that the extract be carefully broken up, so as to allow all the ether to escape. He gets the best results with ether of .717 sp. gr.; the extract obtained by its use dries more quickly, and is not so tough as that obtained when ether of .735 sp. gr. is used.

Gum-Resins, Resins, and Balsams. M. Bamberger. (*Monatshefte*, xi. 84–86.) The author has examined a number of these substances with the object of determining their methyl-number. Among others he gives the following:—Ammoniacum, 11; asafoetida, 18; benzoin, 13.3–30; dragon's blood, 33.8; guaiacum resin, 84; myrrh, 13.2; olibanum, 5.3; balsam of Peru, 14.4; tolu balsam, 46.8.

Dragon's Blood. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxi. 519). According to information received by the author from the Director of the Government Botanic Gardens in Java, dragon's blood of the best kind is evidently the produce of a species of calamus, different from that affording the inferior qualities. The species of calamus yielding the resin appear to be imperfectly known. The colour of the specimens in flat cakes, three inches long, one inch wide, and about a quarter of an inch thick, is brighter than in any of the other commercial forms of the article.

Palembang Benzoin. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xxi. 519). In reporting on a sample of this drug received from the Director of the Government Botanic Gardens in Java, the author calls particular attention to the large proportion of water contained in this variety of benzoin, and to the very characteristic odour, which strongly resembles that of storax. He expresses a doubt that this drug is obtained from the same species yielding Sumatra benzoin.

Resin of Jalap. J. P. Suess. (*Amer. Journ. Pharm.*, September, 1890, 435.) The author has examined four samples of jalap tubers and two of the powdered drug, obtained from reliable dealers in different parts of the United States. The finely powdered drug was exhausted by maceration and percolation with alcohol sp. gr. 0·820, the tincture concentrated and treated with water and the resulting resinous precipitate washed repeatedly with water and then dried. Of the four samples of tubers one yielded only 7·285 per cent. of resin, of which 14 per cent. was soluble in ether; a second gave 9·285 per cent, with 10 per cent. soluble in ether; a third 15 per cent. with 9 per cent. soluble in ether; and the fourth, 14·5 per cent., with 8 per cent. soluble in ether. Of the powder one yielded 7·714 per cent. of resin, of which 12·5 per cent. was soluble in ether, and the other 11·771 per cent., of which 11 per cent. was soluble in ether. With one exception, the larger the yield of resin the smaller was the proportion of it soluble in ether. It follows from the results obtained that only one of these specimens came up to the standard of the United States Pharmacopœia, which requires that the tubers shall yield to spirit not less than 12 per cent. of resin, of which not over 10 per cent. may be soluble in ether, whilst only two of them would have satisfied the British Pharmacopœia requirements. The author regards his results as showing that the requirement of the pharmacopœia respecting the proportion of resin in the tubers should be altered to about 8 per cent.

Therapeutic Properties of Guaiac Resin. W. Murrell. (*Medical Press and Circular*.) The author calls attention to the valuable laxative properties of this resin. He has employed it in the form of lozenges prepared with black currant paste, or as a confection containing 10 grains of the resin to one dram of honey; of the latter preparation one or two drams are given three times daily.

Essential Oil of Asafoetida. F. W. Semmler. (*Ber. der deutsch. chem. Ges.*, xxiii. 3530-3533, and xxiv. 78-81.) The

author has succeeded in fractionating this oil under diminished pressure, and has found it to consist of two terpenes, $C_{10}H_{16}$, a sesquiterpene, $C_{15}H_{24}$, and two sulphur compounds answering respectively to the formulæ $C_7H_{14}S_2$ and $C_{11}H_{20}S_2$. The sesquiterpene alluded to has a pleasant lavender-like odour. Of the two sulphur compounds, the one of the formula $C_7H_{14}S_2$ is lighter and the other one heavier than water.

The oil does not contain any allyl sulphide.

Kesso Oil. J. Bertram and E. Gildemeister. (*Archiv Pharm.*, ccxxviii. 483–492.) Kesso is the Japanese name for *Valeriana officinalis* var. *angustifolia*; the oil obtained by distilling the root of this plant with steam has a sp. gr. of 0.996, whilst the sp. gr. of oil of valerian is 0.945.

The oil contains acetic and valeric acids, valeraldehyde, lævopinene, dipentine, terpinol, borneol, and a new substance of the formula $C_{14}H_{24}O_2$, which the author describes under the name of *kessyl alcohol*. The latter is contained in the heaviest portions of the oil boiling at about 300° C.

Oil of Stavesacre Seeds. M. Haensel. (*Pharm. Journ.*, 3rd series, xxi. 380.) By distillation with steam in a partial vacuum the author obtained from these seeds 0.02 per cent. of a brownish red essential oil, having a peculiar, not exactly disagreeable odour, at first recalling that of the sulphydric compound of carvol; it had a weak acid reaction and was soluble in ether, chloroform and alcohol. The seeds after distillation yielded to pressure about 16 per cent. of a fixed oil of a bright pale green colour, having an extremely disagreeable penetrating odour and showing marked physiological activity.

Volatile Oil of Aristolochia Reticulata. J. C. Peacock. (*Amer. Journ. Pharm.*, June, 1891, 257–264.) The author finds this oil to contain the following constituents:—

(1) A terpene, $C_{10}H_{16}$, boiling at 157°; of sp. gr. .865, having a strong affinity for bromine: characters which ally it to the pinene group of Wallach's classification.

(2) A fraction, boiling at 211°; of sp. gr. .9849, having the composition $C_{15}H_{25}O_2$; and which by saponification with potassium hydrate gives a camphor-like body melting at 199.5–200°, having the composition $C_{10}H_{18}O$, and other properties of borneol; and a peculiar acid substance. This fraction comprises about 60 per cent. of the oil, and consists of about two-thirds of borneol.

(3) A fraction, boiling between 239–240°; of sp. gr. .9888,

having the composition $C_{18}H_{29}O$; and being, apparently, a neutral or indifferent substance.

(4) Some green or bluish green fluorescent oil, in small quantity, which readily decomposes at the temperature necessary for its distillation under reduced pressure.

Oil of Sassafras. C. Pomeranz. (*Monatshefte*, xi. 101–103.) Grimaux and Ruott (*Comptes rendus*, lxxviii. 928) have shown this oil to consist of safrol, $C_{10}H_{10}O_2$, with about 10 per cent. of a terpene, $C_{10}H_{16}$, and a small proportion of a phenol-like compound which can be extracted from the oil by shaking with dilute solution of potash. The author has investigated the last named body and found it to be identical with eugenol.

Oil of Mace. F. W. Semmler. (*Ber. der deutsch. chem. Ges.*, xxiii. 1803–1810.) This oil was found to consist of 53 per cent. of a mixture of terpenes and of a higher boiling oil assuming the form of white needles on cooling, which the author proposes to name *myristicin*. The composition of the latter is represented by the formula $C_{12}H_{14}O_3$. The crude oil also contains a small quantity of a phenol-like substance, giving a green coloration with ferric chloride, and turning dark green by oxidation on exposure to the air.

Oil of Fennel. O. Wallach and F. Hartmann. (*Liebig's Annalen*, celix. 324–331.) Oil of fennel has yielded to the authors a liquid constituent of sp. gr. 0·934, possessing a strong odour of camphor, and boiling at 190–193°; it has the composition $C_{10}H_{16}O$, and is named by the authors *fenchol*. The chemical behaviour of fenchol is that of an isomeric of camphor; it combines with bromine in well-cooled light petroleum solution, yielding a bright red, crystalline, unstable additive product, which is reconverted into fenchol on treatment with soda, it also yields with sodium, a solid compound, which seems to be converted into an acid by carbonic anhydride.

Commercial Oil of Citronella. J. C. Umney. (*Pharm. Journ.*, 3rd series, xxi. 922–923). The more common Indian grass oils, known in trade as verbena, ginger-grass, and citronella, the products respectively of *Andropogon citratus*, *A. Schænanthus*, and *A. nardus* differ considerably in appearance. The first two are usually of a yellowish brown colour: the third varies, being sometimes yellow, at others emerald-green, the yellow oil generally becoming green on exposure to light.

In order to determine on what the difference in colour of this last, and the change from yellow to green which takes place,

depend, eight samples of citronella oil were obtained from various sources, and a small quantity of each exposed to direct sunlight. Of this number five were decidedly green before exposure, two were yellow at first, but rapidly became green, whilst one was yellow originally and underwent no change. The examination proved that, with the exception of the last named sample, all contained minute quantities of copper, emanating probably from the copper stills used in the distillation of the oil. The removal of the copper caused the oil to assume a yellow colour, but the green colour could be restored again by the introduction of a trace of that metal. The conclusion is therefore justified that copper is the cause of this green coloration, and that pale yellow, and not green, is the natural colour of citronella oil.

One of the samples examined proved to be adulterated with petroleum, and had a sp. gr. of .870. According to Messrs. Schimmel the gravity of the oil should not be below .89 at 15° C.

Oil of Rosemary. R. A. Cripps. (*Pharm. Journ.*, 3rd series, xxi. 937-939.) The author performed a series of experiments with a number of authentic specimens of this oil obtained from various sources. He arrives at the following conclusions:—

(1) Generally speaking the specific gravity of English oil is higher than that of the foreign. Three samples of English oil gave .911, .924, and .901, while the foreign oil varies from .881 to .907.

(2) English oil is more soluble in spirit than foreign.

(3) The colour reactions of the oil are similar although scarcely identical.

(4) The bromine absorption of English oil is much lower than that of the foreign.

(5) English oil of rosemary is lævo-rotatory.

Further Note on Oil of Rosemary. R. A. Cripps. (*Pharm. Journ.*, 3rd series, xxi. 1150.) The author replies to some criticism of his conclusions (preceding abstract) occurring in Schimmel and Co's report, in which it is stated that the specific gravity of rosemary oil is not below .900, and certainly never below .890, and that the oil is dextro-rotatory. The author gives further evidence in support of his previous statements, and arrives at the following conclusions:—(1) That the use of the dried plant by Messrs. Schimmel has led them to form erroneous conclusions; the drying would almost certainly profoundly modify the nature of the oil obtained, both by giving opportunity for oxidation and also by loss of the more volatile hydrocarbon. (2)

That variations of soil and climate greatly alter, not only the *yield*, but also the *nature* of the oil, which consideration also appears to have received insufficient attention.

Norwegian Oil of Juniper. C. Nicolaysen. (*Bied. Centr.*, 1890, 278-279.) Ripe juniper berries from Trondhjem yielded to the author 0.34 per cent. of essential oil; unripe berries from Gudbrandsthal 1.73 per cent.; and sprays bearing ripe and unripe berries from Tromsö 1.91 per cent.

Oil of Bergamot. (*American Druggist*, from Schimmel and Co.'s Report for April, 1891.) Pure oil of bergamot is stated to be a scarce article. At present the principal adulterant is said to be oil of lemon, of which a special kind is made for this purpose, being pressed by machine. Schimmel and Co. furnish valuable data for distinguishing the pure oil from mixtures of it with oil of sweet orange or oil of lemon.

The most reliable criteria are the specific gravity, the rotatory power, and the solubility in alcohol. It is even possible, by a careful determination of the two former, to ascertain, quite closely, in what proportion the several oils have been mixed.

Pure Oil of Bergamot.

Spec. grav.: 0.881 to 0.885.

Rotation (100 Mm. tube): + 8° 30' to + 19° 30'

Pure Oil of Sweet Orange.

Spec. grav.: 0.849 to 0.855.

Rotation (100 Mm.): + 97° 4' to + 97° 32'

Pure Oil of Lemon.

Spec. grav.: 0.857 to 0.863.

Rotation (100 Mm.): + 40° 10' to + 62°.

Addition of oil of orange, therefore will depress the specific gravity of oil of bergamot, and at the same time increase its rotation. Moreover, it will lose its solubility in a small quantity of alcohol of 90 per cent.

Less notable are the physical changes of oil of bergamot when it is sophisticated with oil of lemon. Nevertheless, even in this case, the same alterations in specific gravity and rotation are noticeable, though in a minor degree. The solubility in alcohol is likewise diminished.

Admixture of oil of turpentine is less common. It is usually recognised by the odour and by a lower specific gravity.

Addition of fatty oils is recognised by an increased specific gravity, and by the residue which is left behind on evaporating the oil at 100° C. Even pure oil, however, leaves a residue. On evaporating about 2 grams of the pure oil upon a watch glass at 100° C. until the odour has completely disappeared, there remains a green, homogeneous residue of the consistence of ointment, which amounts to about 6 per cent. in a good oil. In *fresh* oil, which has not been completely clarified by standing, the percentage is sometimes a little higher. If any fatty oil is present, however, the amount of residue is larger and has a different consistence. At the bottom there will be a green, thick, greasy mass, and above it an oily, yellow liquid.

Upon the basis of what has been stated, the following conditions should be complied with by a good oil :—

The specific gravity should not be below 0.880; the rotation, in a 100 Mm. tube, not over $+ 20^{\circ}$. The oil should be soluble to a clear liquid in half its volume of alcohol of 90 per cent., and this solution should not become cloudy upon the addition of more alcohol. On evaporation, the oil ought not to leave more than 6 per cent. of residue, which should be a green, homogeneous mass.

Oil of Peppermint. E. Polenske. (*Pharm. Zeit.*, 1890, 547; *Amer. Journ. Pharm.*, October, 1890.) The author has investigated the colour reaction of peppermint oil with acetic, sulphuric and hydrochloric acids (formation of a blue colour with a red fluorescence). If 3 c.c. hydrochloric acid sp. gr. 1.124 be agitated with 20 drops of the oil and slightly warmed, a violet colour will finally result; if twice the volume of ether be then added, the colour will be imparted to the acid, which separated and diluted with an equal volume of water, will give a precipitate of blue colour, while a red colouring principle will remain in solution; the red filtrate shows no fluorescence, while the acetic acid or alcoholic solution of the thoroughly washed blue precipitate possesses a red fluorescence. A better yield of the blue colour is obtained by adding 4 drops of concentrated sulphuric acid to 20 c.c. of oil, agitating, warming to 40° C., allowing to stand several hours with occasional agitation, adding 80 c.c. of ether, shaking with two portions of hydrochloric acid of two c.c. each, separating the acid and proceeding as above. Addition of ammonia to solutions of the colours causes decolorization, from such solutions ether will extract a brownish substance (free from nitrogen), which, with acids, will produce again the original colours. The ethereal residue exposed to sunlight for a short time is bleached, and then no

longer gives the colorations on addition of acids. Peppermint oil exposed for three to four hours to sunlight does not lose the property of colouring with the acids, but after twenty-five days exposure it will no longer respond. The substance producing the colorations is volatile in a current of steam, and is, therefore, present in rectified oils.

Oil of Peppermint. E. Hirschsohn. (*Pharm. Zeitschr. für Russland*, 1890, 708.) The iodine test for the purity of oil of peppermint of the German and Russian Pharmacopœias, in which an adulteration with oil of turpentine is indicated by a rise in temperature or by slight detonation, has been examined by the author, who finds that all peppermint oils produce with iodine an increase in temperature; and that to cause detonation at least 40 per cent. of oil of turpentine would have to be present, as smaller quantities fail to produce this effect.

Russian Oil of Peppermint. H. Andres. (*Pharm. Zeitschr. für Russland*, xxix. 341-343 and 357.) The oil examined by the author was obtained from the fresh herb. It had a greenish yellow colour, a specific gravity of 0.915 at 15° C., and a rotatory power $\alpha_D = -17.13$. It consisted of menthene, two terpenes, one of which proved identical with Wallach's *limonene*, menthone and menthol. The spectroscopic characters did not exhibit much difference from those of English oil of peppermint, but the several changes were observed to occur more quickly with the Russian than with the English oil.

Oil of *Mentha Pulegium*. M. Pleissner. (*Liebig's Annalen*, cclxii. 1-37.) The author reports that the principal constituent of this oil has a boiling point of 130-131° C., a specific gravity of .9323 at 20° C. and a composition corresponding to the formula $C_{10}H_{16}O$. It is colourless and dextro-rotatory $[\alpha]_D = +22.89^\circ$. It is a ketone for which the author suggests the name *pulegone*.

Poisonous Properties of the Oil of Sage (*Salvia Officinalis*). M.M. Cadéac and Albin. (*Société de Biologie*, April 11, 1891.) The authors call attention to the toxic properties of oil of sage, and state that it is capable of producing convulsions resembling those of epilepsy.

Indian Oil of Geranium. F. W. Semmler. (*Ber. der deutsch. chem. Ges.*, 1890, 1098-1103.) This oil is derived from *Andropogon Schœnanthus*. It has a specific gravity of .8869 at 16° C. and in a column 100 mm. long it rotates the plane of polarized light 20' to the left. Its principle constituent is *geraniol*, $C_{10}H_{18}O$,

which amounts to 92 per cent. of the whole, and is an alcohol belonging to the series $C_n H_{2n-2} O$.

Oil of Cassia. E. Hirschsohn. (*Pharm. Zeit. für Russland*, 1890, 692.) With regard to the detection of an adulteration with resin in oil of cassia, the author points out that the distillation of the oil, if not properly conducted, may lead to the condemnation of a pure oil; if in the distillation the retort be exposed so that the atmosphere cools the upper portion, the distillation proceeds slowly, and as much as *sixty* per cent. of residue is obtainable; but if the retort be surrounded by some non-conducting material, like asbestos, the distillation is rapid and only *five* per cent. of residue is obtained from the same oil. The residue in the first case has all the characteristics of asphalt: solubility, odour, colour; while in the distillate are found water, acetic acid, phenol and hydrocarbons. These results would indicate that the asphalt found in nature may have been produced by the action of heat and, probably, pressure upon essential oils or resins.

Tests for the Purity of Oil of Cassia. E. Hirschsohn. (*Pharm. Zeit. für Russland*, xxix. 225.) (1) The oil is shaken in a graduated tube with three volumes of light petroleum (0.65). A diminution in its volume indicates the presence of other ethereal or fat oils, or of resin or kerosene; an increase would probably be due to the presence of much castor oil. (2) The petroleum extract is shaken with copper hydrate. A blue solution indicates colophony or copaiba balsam. (3) One volume of the oil must give a clear or merely opaline solution with three volumes of 70 per cent. alcohol at 15°. A turbidity or sediment indicates the presence of petroleum, or of foreign ethereal or fatty oils, or of a large excess of colophony. (4) The alcoholic solution from 3 is poured into half its volume of a cold saturated solution of lead acetate in 70 per cent. alcohol. No precipitate should be produced.

To estimate the cinnamaldehyde in the oil, 75 grams of it are well shaken in a capacious flask with 300 c.c. of a boiling, 30 per cent. solution of sodium hydrogen sulphite. After a short time, 200 c.c. of hot water are added, and the whole is warmed on the water-bath until the compound of the aldehyde with the sulphite is completely dissolved, when the constituents other than aldehyde and all the impurities form an oily layer on the surface. After cooling, this oily layer is dissolved in ether, and the filtered ethereal solution is evaporated in a tared beaker as rapidly as possible on the water-bath, and is weighed at intervals of ten minutes. When two weighings differ by no more than 0.3 gram, the last but one is

taken as that of the non-aldehydic substances present. The cinnamaldehyde is known from the difference. Cinnamic acid, if present, may be removed by shaking the oil with hot sodium carbonate solution, and the amount found deducted from that of the aldehyde ascertained as above.

A rough technical method for the same purpose consists in placing 10 c.c. of the oil in a special flask of about 100 c.c. capacity, with a cylindrical neck graduated in tenths of a cubic centimetre. The oil is treated in the flask with the sodium hydrogen sulphite, and when the crystalline sulphite has been completely dissolved by prolonged heating on the water-bath, and the non-aldehyde constituents have formed a clear oily layer on the surface, they are driven up into the graduated neck by cautious addition of sulphite solution, and their volume is read off when cold. The specific gravity of the non-aldehydic oil may, without serious error, be taken as 1.06 at 20°, or identical with that of the original cassia oil. A good cassia oil should contain at least 75 per cent. of cinnamaldehyde.

Test for the Purity of Essential Oil of Bitter Almonds. J. Morpurgo. (*Chem. Centr.*, 1890, i. 879.) The sample under examination is warmed with manganese dioxide and sulphuric acid. Under these circumstances, nitrobenzol does not lose its odour; bitter almond oil, on the contrary, develops a disagreeable odour at first, which soon disappears altogether. In the case of liquors, soaps, etc., the mixture is warmed with calcium hydrate, and after cooling extracted with ether. The residue obtained after evaporation of the ether is treated with two drops of liquid carbolic acid, three drops of water, and a piece of potash the size of a pea added, and the mixture warmed carefully. If nitrobenzol is present, a carmine ring forms on the edge of the liquid, which becomes green on the addition of bleaching powder.

Kuro-Moji Oil. W. Kwasnick. (*Ber. der deutsch. chem. Ges.*, xxiv. 81-82.) Kuro-moji oil is the ethereal oil of *Lindera fericia*, Bl., one of the Japanese *Lauraceæ*, the use of which in Europe has largely increased of late. It is obtained from the leaves, and has a dark yellow colour, a sp. gr. of 0.901 at 18°, and a powerful aromatic smell. Its slight optical activity is due to the fact that it is a mixture of dextro- and lævo-rotatory constituents. By fractional distillation and treatment with sodium, it yields two terpenes, which have been identified by their derivatives as *dextrolimone* and *dipentene*. In addition, two substances containing oxygen are

present, namely, inactive terpinol and lævocarvol. The former has hitherto only been found in the oil of cardamom seeds and in kesso oil, obtained from a Japanese valerian. The carvole differs only from that obtained from cummin oil in possessing opposite optical properties.

Eucalyptus Oil. P. W. Squire. (*Chemist and Druggist*, September 13, 1890.) The author noticed very considerable variations in a number of samples of eucalyptus oil, stated to be the product of *Eucalyptus Amygdalina*. The tests applied were: (1) Specific gravity; (2) Rotation, shown by a Zeiss polarimeter; (3) "Phellandrene" test, the presence of which is understood to distinguish the *Amygdalina* oil from that obtained from *E. Globulus*.

—	Sp. Gr.	Rotation.	" Phellandrene."
A . . . .	.912	+ 12°	None
B . . . .	.909	+ 12°	Strong " reaction
C . . . .	.874	- 33°	" "
D . . . .	.889	- 24°	" "
E . . . .	.897	- 30°	" "
F . . . .	.893	- 3°	" "
G . . . .	.877	-120°	Very strong reaction
H . . . .	.874	-111°	" "
I . . . .	.909	- 5°	None

Subjoined are also the figures for some oils invoiced as *Globulus* :—

—	Sp. Gr.	Rotation.	" Phellandrene."
Californian .	.809	+ 17	None
Schimmel .	.915	+ 7	"
Merck . . .	.904	+ 11	"
Gehe . . .	.921	+ 4	"

The following general inferences may be drawn :—

A and B are obviously *Globulus*, and show that two of the largest London wholesale houses, ignorantly or intentionally, are supplying this for *Amygdalina*.

C, D, E, and F are normal *Amygdalina* oils.

G and H are a variety of *Amygdalina* oil, of which we have as yet seen no description. It is characterized by an abnormally high

rotation, so high that the Zeiss instrument was incapable of measuring the angle till the oil was diluted with absolute alcohol. The phellandrene reaction was also very strongly marked. One of the oils (G) was very dark yellow, and the other (H) quite colourless, but their other characters are so much alike that it is probable H is G redistilled.

I is an oil intermediate between the *Amygdalina* and *Globulus*, and is probably distilled from mixed leaves. It was obtained directly from the firm who were the first to accentuate the radical differences between the two varieties.

Florida Camphor. J. M. Maisch. (*Amer. Journ. Pharm.* November, 1890, 565.) The author reports upon the great success attending the cultivation of the camphor tree in Florida. The tree seems to flourish in almost any soil, and it is predicted that before very long the camphor industry will prove more profitable than that of sugar. The camphor obtained from the Florida trees approaches more nearly to that of Japan than to Chinese camphor, since the odour of safrol is distinctly recognisable.

New Therapeutic Properties of Thymol. E. Lawrie. (*Lancet*, February 16, 1891.) The author reports the cure of two cases of chyluria dependent on filariæ in the blood, by treatment with thymol. It was administered internally in doses of one grain every four hours, gradually increased to five grains.

Birchwood Creosote (*Oleum Betulini Rectificatum*). M. Pfrenger. (*Archiv der Pharm.*, December 29, 1890, 713.) The oil reported upon was a thin, light-refracting liquid of a yellow-brown colour, acid reaction, and a specific gravity of 0.956. It has a distinct odour of Russian leather. The author's chemical examination of the oil shows that it is composed of guaicol and cresol, with a small proportion of xylenol, and probably traces of phenol.

An Oil from *Tilia Parvifolia*. C. Müller. (*Pharm. Zeit.*, 1891, 97.) The author states that the seeds of *Tilia parvifolia* yield about 58 per cent. of an oil, the properties of which should warrant its extraction on a large scale. In colour and taste it is equal to the best olive oil; it is a non-drying oil and will not become rancid. At low temperatures (-21.5°C .) it does not congeal.

Constituents of Lycopodium Oil. A. Bukowski. (*Pharm. Journ.*, 3rd series, xxi. 496.) The oil is extracted by ether from crushed fresh spores of *Lycopodium clavatum*. It is a neutral

fatty oil resembling almond oil. The following substances were separated from it:—

0.8 per cent.	.	Phytosterin	.	.	.	$C_{25}H_{42}O$.
2.0	"	.	Lycopodic acid	.	.	$C_{18}H_{30}O_4$.
80.0	"	.	Oleic acid	.	.	$C_{18}H_{34}O_2$.
		.	Arachic acid	.	.	$C_{20}H_{40}O_2$.
3.0	"	.	Stearic acid	.	.	$C_{18}H_{36}O_2$.
		.	Palmitic acid	.	.	$C_{16}H_{32}O_2$.
8.2	"	.	Glycerine			
6.5	"	.	Loss			

Note on Chaulmoogra Oil. J. Moss. (*Pharm. Journ.*, 3rd series, xxi. 720–721.) The author records a number of experiments confirming the correctness of his previous statement that “at the ordinary temperature, alcohol (sp. gr. .807) dissolves a considerable proportion of this oil,” which had been called in question by L. Roux. In opposition to the same author, he also insists that the method previously published by him for the isolation of gynecardic acid from this oil, is capable, if carefully carried out, of yielding a chemically pure product.

Castor Oil. H. Meyer. (*Archiv für exper. Pathol.*, xxviii. 145.) The author's investigation shows that the purgative action of castor oil is due both to the ricinoleic acid and to its glyceride.

Ricinelaiddic acid, a product of the action of nitrous acid on ricinoleic acid, also possesses purgative properties.

The Purity of Castor Oil. J. A. Wilson. (*Chem. News*, October 31, 1890.) The author states that in carrying out the alcohol test, it is best to operate as follows:—One measure of the castor oil under examination is mixed thoroughly with two volumes of spirit of exactly 0.838 specific gravity, and then heated, stirring well with the thermometer till a perfect solution is obtained. In the case of genuine castor oil this will be between 38° and 43° C.; whilst if any foreign oil be present, the temperature required will be much higher; and in gross adulteration, some portion of the oil may not be dissolved even at the boiling point of the mixture.

Croton Oil. A. Reuter. (*Apotheker Zeitung*, July, 1890, 362. From *Pharm. Journ.*) In a further contribution on this subject the author reports upon samples of croton oil prepared by himself from the seed. Water agitated with these oils and then separated from them, left upon evaporation on a water-bath a yellowish residue, which when again treated with water gave up the coloured constituent, leaving a white insoluble substance as a residue. The clear aqueous solution gave a precipitate with potassium iodo-

dide; it also reduced Fehling's solution, though not until it had been boiled some time with hydrochloric acid, which also produced an intense cherry-red coloration. The constituent of the residue soluble in water was therefore a glucoside. The insoluble white substance, after washing with water, gave with hydrochloric acid no colour reaction, but with soda solution and cupric sulphate it gave an intense violet-blue biuret reaction; it did not reduce Fehling's solution. From these reactions the white body would appear to be an albuminoid, and the author thinks it may be the same as the one separated by Stillmark and Kobert from croton and castor oil seeds, as its occurrence in a pressed oil would be easily explicable. He thinks that the presence of even minute quantities of an active albuminoid ferment might cause the splitting up of the crotonic glyceride, with the liberation of free crotonoleic acid, which is said to take place in an oil that is kept. The author is in accord with previous writers as to the desirability of using a neutral oil for medicinal purposes, and suggests that such an oil might be conveniently prepared by treating crushed croton seeds with an equal volume of absolute alcohol to remove free crotonoleic acid and then exhausting them with petroleum ether.

Macassar Oil. K. Thümmel and M. Kwasnick. (*Pharm. Zeitung*, May 20, 1891. From *Amer. Drugg.*) The oil from the seeds of the *Schleichera trijuga*, from the Sunda Islands, where it passes under the name of "Macassar oil," and enjoys a great reputation as a hair dressing and means of removing scurf and eczema, has been submitted to examination by the authors. It was found that the seeds, which contained no starch grains, yielded to petroleum-ether 68 per cent of fixed oil, but from the seeds freed from epidermis only 45·8 per cent. was obtained by pressure. The oil was in both cases of the consistence of butter, yellow, mild in taste, and with an odour of bitter almonds. It melted at 21° to 22° C., but after long standing the more solid glycerides separated, melting at 28°, and appearing under the microscope as fine needles. The fatty acids, with the exception of 3·14 per cent. of free oleic acid, were present as glycerides. Of those in combination, 70 per cent. consisted of oleic acid, 5 per cent. of palmitic acid and 25 per cent. of arachic acid. Lauric acid was not present; and of the volatile fat acids, only acetic acid and no butyric acid could be detected. Hydrocyanic acid was found in the oil and in the seeds, being determined as 0·03 per cent. in the former and 0·62 per cent. in the latter. No amygdalin could be detected in the seeds, but hydrocyanic acid, benzaldehyde, and grape sugar,

possibly the decomposition products of it, were found. A small quantity of cane sugar was also separated.

Cocoa-Butter. F. Filsinger. (*Chemiker Zeitung*, xiv. 716.) The author has examined a number of cocoas from various origins, with special reference to their iodine number. His results show that the iodine number for pure cocoa-butter varies between 33.4 and 37.5.

Detection of Sesame Oil as an Adulterant in Olive Oil. J. F. Tocher. (*Pharm. Journ.*, 3rd series, xxi. 638.) The author finds that the tests generally employed for this purpose fail to detect the adulterant unless it be present in very large proportion. He proposes the following as a much more satisfactory mode of examination which admits of the ready detection of 5 per cent. or even less of sesame oil. Prepare a solution of pyrogallol in pure hydrochloric acid (3ss. to ʒj.). Measure half an ounce of this solution into a wide-mouthed test-tube provided with a cork, and add half an ounce (an ounce if the proportion of sesame oil be small) of the oil to be tested. Shake vigorously and then set aside for about a minute to allow the oil and acid to separate. Draw off the supernatant liquid by means of a pipette, and boil the hydrochloric acid solution for about five minutes, when, if sesame oil be present, the colour of the solution will have changed to purple. The colour does not appear at once, but develops on boiling for a short time. When viewed by transmitted light, the colour is wine-red to purple, and by reflected light it is blue, which is best observed by pouring the solution into a small porcelain basin. When the purple solution is allowed to stand for some time a small purple deposit takes place. This has not yet been examined.

Isolation of a New Substance from Sesame Oil. J. F. Tocher. (*Pharm. Journ.*, 3rd series, xxi. 639.) The "Pharmacographia" states that "sesame oil contains an extremely small quantity of a substance, perhaps resinoid, which has not yet been isolated. It may be obtained in solution by repeatedly shaking five volumes of the oil with one of glacial acetic acid. If a cold mixture of equal weights of sulphuric and nitric acids be added in like volume, the acetic solution acquires a greenish yellow hue. The oil itself being gently shaken with nitro-sulphuric acid takes a fine green hue, as shown by Behrens in 1852, who pointed out that no other oil gave the same reaction."

The author satisfied himself that the reaction caused by nitro-sulphuric acid was due to a constituent in the extractive, as

implied in the Pharmacographia. Whilst engaged in the study of a new reaction of this oil (see preceding abstract), he endeavoured to separate the resinoid substance said to be present. Ten volumes of the oil were shaken vigorously with seven volumes of acid, and then set aside for separation. The acid was then drawn off into a porcelain basin and placed over a water-bath, in order to drive the acid completely off. The residue was gelatinous, transparent and amber-brown in colour. It was at this stage that the pyrogallol reaction (preceding abstract) was obtained. A small quantity of the gelatinous extract was now treated with dilute potash and warmed. No result was obtained by doing so, but when the solution was vigorously shaken and then allowed to stand for some time, it was found that a white deposit had taken place. Meanwhile it was found that the extract was partially soluble in hot alcohol, and that when diluted with distilled water, a deposit also took place there. A little of this deposit when examined under the microscope showed the presence of small crystalline needles; but the whole quantity of these crystals was too small for examination. The remainder of the gelatinous extract was therefore treated with warm dilute potash, shaken from time to time vigorously and set aside for twelve hours in a conical test glass, in order to collect the deposit. The supernatant fluid was siphoned off, and the deposit washed several times with distilled water. It was now boiled in dilute HCl, collected on a filter, washed until the washings ceased to give an acid reaction, and then dried in a water-oven. The substance was found to be soluble in alcohol. It was therefore dissolved in hot alcohol and set aside to crystallize. Long crystalline needles were formed in the course of a few hours which, when collected, washed and dried, melted at $116-118^{\circ}$ C. Subsequent recrystallization was resorted to in order to ascertain whether the melting-point was constant. The substance again melted at $117-118^{\circ}$ C. It was found to be soluble in benzol, turpentine, carbon bisulphide, and of course alcohol and glacial acetic acid, very soluble in chloroform, insoluble in water and alkalies and also hydrochloric acid, and decomposed by sulphuric and nitric acids. It was quite neutral to litmus and other indicators. It gave no reaction with HCl solution of pyrogallol, proving that it was not the cause of the purple colour which formed the base of the new test. Nitro-sulphuric acid, however, gave a green and then bright red colour, similar to that obtained on treating the gelatinous extract with the same reagent, and corresponding to the U. S. P. test for sesame

oil. On treating the alkaline liquor from which the substance had deposited with HCl solution of pyrogallol, the purple colour was at once obtained. The new substance may therefore be considered as the cause of the colour described in the U. S. P., but not of the pyrogallol coloration. The gelatinous extract would therefore appear to be a mixture of substances and not a simple resinoid body as might be inferred from the Pharmacographia.

The following is a comparison in a tabulated form between the properties of the new substance and those of oleic acid:—

With Nitro-sulphuric Acid:—New substance, green, then bright red; Oleic acid, brownish.

With Nitric Acid:—New substance, green, then yellow.

With Pyrogallol Solution:—New substance, no reaction; Oleic acid, faint red.

With Sugar and Sulphuric Acid:—New substance, brownish; Oleic acid, brown, afterwards bright violet.

Neither stearic, palmitic nor myristic acids gave any definite colour with the foregoing reagents.

From half-a-gallon of the oil the author obtained a yield of crystals equivalent to .04 per cent. The mean result of three combustions was as follows:—

	Mean.
C	= 30.53.
H	= 5.43.
O	= 64.04.

The molecular weight could not be determined for want of material.

Detection of Adulteration in Olive Oil. R. Brullé. (*Comptes rendus*, xxi. 977.) On heating 10 c.c. of the olive oil in a water-bath for half an hour, with 5 c.c. of a 25 per cent. solution of silver nitrate in alcohol of 90°, the oil, if pure, should remain transparent, and acquire a grass-green colour. Oil of sesame thus treated turns yellowish red, earth-nut oil reddish brown, cotton-seed oil black, colza oil also black, linseed oil deep red, and poppy-seed oil greenish black.

Simple Method for Determining the Specific Gravity of Waxes, Resins and Solid Fats. A. Gawalowski. (*Pharm. Zeit.*, 1890, 427.) The specific gravity of waxes, resins and solid fats is easily and rapidly determined by taking a cylindrical piece 1-1.5 cm. long and 0.5 cm. in diameter (made by pouring the melted substance into a proper mould), weighing it, placing it in a dry,

narrow-necked small flask of known capacity, and allowing water to run in from a burette; the substance should lie horizontally in the flask, so that when the water is added it does not rise into the neck of the flask. The weight of substance divided by its own volume of water gives the desired specific gravity. If the weight of the substance is 0.624, the capacity of the flask 25 c.c., and if after introducing the fat, only 24.3 c.c. of water are required to fill the flask up to the same point, then $\frac{0.624}{0.7} = 0.891$ is the specific gravity. The temperature should be kept at 15° C. during the determination.

Cod-Liver Oil. H. Unger. (*Chemist and Druggist*, December 6th, 1890.) The author called attention in 1888 to the characteristics of three samples of cod-liver oil representing the three principal qualities. It appeared he then found that the dearest oil was of sp. gr. 0.928, contained 1.69 per cent. of free acid, and gave a distinct ring of albumen when poured upon nitric acid. The cheapest oil was of 0.925 sp. gr., contained 4.78 per cent. of free acid, and gave no albumen ring. A middle-class oil was of 0.929 sp. gr., gave no albumen ring, and contained 7.33 per cent. of free acid. A year later the first sample was practically unchanged, but the second contained 6.76 of free acid, and the third 7.47. The best oil still gave the albumen ring, the others did not. Last year he examined four samples of fresh Lofoden oil, with the following results:—

—	Finest Oil.	Pale.	Somewhat Darker.	The Darkest.
Sp. gr.	0.926	0.923	0.9235	0.923
Free fatty acid	Neutral	4.37	6.76	8.49
With 1.400 nitric acid	Beautiful ring after 3 hours	Feeble ring after 2 hours	No ring	Ring after 2 hours

After keeping these samples for a year in closed bottles, they were again examined, with the following results:—

—	Finest Oil.	Pale.	Somewhat Darker.	The Darkest.
Free acid	0.564	5.92	7.05	9.625
Albumen ring	Very distinct	None	None	Only slight

The specific gravities in the above cases were taken at 11° C. It is evident from these results that there is some connection between the albumen and the free fatty acid, the latter serving to precipitate the former, so that in the case of oils which contain a good percentage of the acid, the albumen is gradually precipitated, and nitric acid reacts but feebly. The author is further inclined to believe that the oils of 1889 were not very good, and that those of 1890 are much better. One sample which he has examined, and which had good body and flavour, and was naturally clear, showed a specific gravity of 0.927 at 10° C., 3.38 per cent. of free acid, and gave an albumen ring. It would seem, therefore, that an oil must not be condemned simply because it contains free acid. The other factors must be taken into account.

The Purity of Bees-Wax. H. Röttger. (*Chemiker Zeitung*, 1890, 1474.) The method of the German Pharmacopœia for ascertaining the purity of bees-wax is as follows: 1 gram of wax is heated with 10 c.c. of water and 3 grams of sodium carbonate to the boiling point for 15 minutes; after cooling, the wax separates above the liquid, which should be only opalescent. In the presence of Japan wax, stearic acid or resin, the wax forms with the soda solution an emulsion, from which, after even a day's standing, the wax does not separate, nor does the solution become almost transparent. The author states that tallow also prevents the separation of the wax and the formation of a nearly transparent solution; mixtures which he made would indicate that 2 per cent. of Japan wax, stearic acid or resin could be detected by forming an emulsion; tallow could only be detected when it amounted to 5 per cent. or more.

The so-called Eucalyptus Honey of Commerce. T. P. Anderson Stuart. (*Pharm. Journ.*, 3rd series, xxi. 513-516.) The author arrives at the conclusion that the drug which has been met with in commerce under the name of eucalyptus honey is not the natural product at all, but is in most cases probably a mere mixture of common honey with a small quantity of oil of eucalyptus leaves.

J. H. Maiden (*ibid.* 517) reports to the same effect.

Eucalyptus Honey. F. W. Passmore. (*Pharm. Journ.*, 3rd series, xxi. 719-720.) In the commencement of this paper the author quotes the following information respecting the origin of the *genuine* eucalyptus honey, supplied by Mr. Coleman in a letter read before a recent meeting of the Pharmaceutical Society: "The dark honey is gathered from the blossoms and leaves of the

manna gum. . . . A sweet juice exudes from the leaves and twigs, and it is gathered by the bees at the same time that they are gathering honey from the flowers of the trees. Both are stored in the same combs, though usually in separate cells, so that one often observes some cells in a comb filled with dark manna juice, whilst others are filled with honey. The comb is all emptied at once, so that the two become mixed in the extractor. The sample contains probably from 25 to 35 per cent. of the manna juice."

In connection with the author's investigation on eucalyptus manna (see page 201), it appeared to him of interest to ascertain the presence of this manna in eucalyptus honey by chemical methods. With this object he tried to identify the constituent sugars in a sample of the honey received from Mr. E. M. Holmes.

The honey consisted of a thick syrup with indications of incipient crystallization, possessed a faintly aromatic odour, not however suggestive of eucalyptus oil, and an unpleasant acrid after-taste. It turned the plane of polarized light to the left to nearly the same extent as inverted cane-sugar.

The chemical examination showed that the principal constituents of the honey were fructose and *d*-glucose, and that these were associated with a very small proportion of galactose. The presence of the last-named constituent seems to have been overlooked by Maquenne, whose results otherwise agree with those recorded in this paper. The author regards the presence of galactose, one of the constituents of melitriose, as strong evidence in favour of the assumption that the eucalyptus manna entered into the composition of this honey.

Japanese Cantharides. Dr. Bosetti. (*Pharm. Zeitung*, March 11, 1891, 163.) These beetles are described as being smaller than the official kind and having a weaker odour. The wing-cases are black, with delicate brown longitudinal stripings, and the head is reddish and relatively large. They have been referred by Dr. Meyer to the species *Epicauta Gorhami*. Nothing is said as to the amount of cantharidin they contain.

Acarus Lini. F. Davis. (*Pharm. Journ.*, 3rd series, xxi. 846.) The author finds that the so-called insects occasionally occurring in crushed linseed are a species of *Acarus*, which he thinks may be appropriately termed *Acarus Lini*. Although he examined fifty-eight samples of the crushed seed, he succeeded only in obtaining two samples thus infested. He finds this *Acarus* to resemble in some respects the *Acarus Sacchari*, and in others

the *Acarus Farinæ*, but it does not correspond with either in all particulars.

Acarus Lini is both oviparous and viviparous, having apparently two principal tracheæ beneath the mandibles, which evidently serve for partial breathing purposes, the remaining respiration taking place by way of the so-called skin.

It is comparatively much larger than the *Acarus Farinæ*, and has fewer and smaller pinnate setæ than the latter. The *Acarus Lini* appears to revel in samples of crushed linseed which has a portion of its natural oil extracted.

Note on Ichthyol. H. Wyatt. (*Pharm. Journ.*, 3rd series, xxi. 929.) Ichthyol is usually ordered enclosed in capsules containing 5 or 10 minims, or in pills of $2\frac{1}{2}$ grains in each, many prescribers ordering the sodium or potassium ichthyolsulphonates, as they are of a firmer consistence, and consequently can be formed into less bulky pills, requiring, as they do, less absorbent powder to mass them.

By evaporating the ammonium ichthyol carefully over a water-bath a dark brown, easily powdered residue is left, which, however, soon becomes a pasty, somewhat deliquescent mass, readily cutting into pills, which should be coated with gelatine or varnished. The author found that 120 grains of ammonium ichthyol yielded 54 grains of residue, a loss equivalent to 45 per cent.

A magnesium compound was obtained by the author in the following manner:—To 120 grains of ammonium ichthyol he added 15 grains of freshly burnt magnesium oxide made into a thin milk with 5iss of water, and evaporated the mixture with constant stirring over a water-bath to dryness, during which process ammonia was given off, a light chocolate-brown powdery mass resulting. On weighing this he obtained 83 grains, that is to say (120 grains of ichthyol and 15 grains of magnesium oxide) 135 grains lost 52 grains in drying, or, roughly speaking, 8 grains of the magnesium ichthyol = 12 grains of ammonium ichthyol.

This magnesium compound formed very good pills on the addition of a little water, and was moreover readily soluble, the therapeutic effect according to the doctor being also satisfactory, so that the evaporation of the mass had not (as the author feared it might do) impaired its medicinal activity. Latterly ichthyol as a topical application has been largely used for erysipelas, and it has occurred to the author that a dusting powder of magnesium ichthyol and powdered talc or French chalk might be used in some cases with advantage.

Physiological Action of Guaiacol. P. Marfori. (*Chem. Centr.*, 1890, 155-156.) The physiological value of guaiacol was first pointed out by Seidel in 1880; but in the absence of distinctive tests of its purity it has hitherto been little employed. The author finds that one part of guaiacol should dissolve in 60 parts of water, and that the presence of impurities renders it more soluble. Its boiling point is 200-202°. One drop of pure guaiacol mixed with a few drops of concentrated sulphuric acid gives a beautiful permanent purple-red coloration, which is interfered with by even a trace of impurity.

The general action of guaiacol consists in first exciting and then paralyzing the nerve centres. The paralytic effects are the feebler the higher the class of animal subjected to its influence. In small doses, guaiacol does not affect the pulse, but larger doses quicken it. The temperature is reduced. After death from the effects of guaiacol, the author has observed, in the case of dogs, that the heart is not affected by electric stimulus, although the other muscles are. Its action is similar to that of phenol or catechol, and it is eliminated from the system in a similar condition; it is, however, not so poisonous as these.

Styracol as a Remedy for Phthisis. A. Haas. (*Südd. Apoth. Zeit.*, 1891, 55.) Styracol is the cinnamic ether of guaiacol. When taken internally, it is decomposed into cinnamic acid and guaiacol, to the latter of which it owes its therapeutic properties. The new compound is made by mixing equal molecules of guaiacol and cinnamyl chloride, allowing to stand for two hours and then warming upon a water-bath; extracted with boiling alcohol, the styracol separates, on cooling, in long needles which, purified by recrystallization from alcohol, melt at 130° C.

Hydrochlorate of Phenocoll. F. G. Hertel. (*Deutsch. med. Wochenschr.*, April 9, 1891, 521; *Pharm. Journ.*, 3rd series, xxi. 977.) This preparation is offered as another addition to the group of antipyretic and anti-rheumatic compounds. It is stated to be the hydrochlorate of amidoacet-p-phenetidine, a base produced by the condensation of glycocoll, or amidoacetic acid, with phenetidine, under the elimination of water. Phenocoll is accordingly represented as a phenacetin into the acetyl radicle of which an amide group has been introduced. Phenocoll is precipitated from a solution of the hydrochloride by ammonia, caustic potash or an alkaline carbonate in white felted crystals containing one molecule of water of crystallization, the crystals melting at 95° C., or

when rendered anhydrous at 100.5° . The pure base is fairly soluble in alcohol, but only slightly so in ether, benzol and chloroform. In hot water it is very freely soluble, but with difficulty in cold, and for this reason the use is recommended of the hydrochloride, which is sent out as a white micro-crystalline powder, forming a neutral solution in sixteen parts of water at 17° C. From hot water phenocoll hydrochloride crystallizes out in cubes and from hot alcohol in needles. Professor Kobert has reported that in some preliminary experiments on animals he found phenocoll to be non-poisonous, and that its administration did not involve injurious changes in the blood as in the case of other antipyretics. Professor v. Mering, who administered the hydrochloride in typhus and pneumonia, states that a dose of 1 gram reduced the temperature about 2° , or about equal to 1.5 to 2 grams of antipyrine or 0.8 to 1 gram of phenacetin, no collapse or cyanosis being observed. The author himself found that simple doses of 0.5 gram quickly lowered the temperature about 0.5° , but only for a short time; single doses of 1 gram produced sometimes within an hour a fall of 1° to 1.5° , lasting about two hours. With 5 grams distributed over the day the fever temperature could be almost entirely controlled. After the administration of about 5 grams of phenocoll the urine becomes coloured brown-red to brown-black; but the elimination appears to occur rather quickly, no reaction being produced in the urine by ferric chloride solution after about twelve hours.

Administration of Hydronaphthol. J. M. Clarke. (*Chemist and Druggist*, December, 27, 1890.) The author has found that hydronaphthol has a very distinct retarding influence on the digestion of egg-albumen by peptic fluids, a very slight effect on the digestion of milk by the same, and no effect at all on pancreatic digestion of milk or albumen, nor on the conversion of starch into sugar. Consequently to most patients dieting on milk only, hydronaphthol may be given without fear of serious interference with digestion; and should there be sickness whilst it is being administered, this is probably due to retardation of peptic digestion and accumulation of undigested curd in the stomach. The author has generally prescribed it in gelatin capsules, or simply suspended in milk, but it would probably be equally efficacious given in the form of pills coated with peratin. As to the dose, 2 or 3 grains every two hours is sufficient; in diarrhoea, after the first three to six doses, it may be given every three or four hours provided the effect is maintained. For children under

one year the dose is $\frac{1}{2}$ grain, for older children $\frac{1}{2}$ to 1 grain every hour or every two hours, or less often according to circumstances.

Two New Antipyretics. E. Münzer. (*Pharm. Centralhalle*, February 26, 1891.) Under the name of *iodoantipyrine*, a substance is introduced to the notice of the profession, which is said to be a compound in which one atom of the hydrogen belonging to the phenyl group in antipyrine is replaced by iodine. The compound is described as crystallizing in shining, colourless, odourless and tasteless prismatic needles, soluble in water and alcohol, and fusing at 160° C. In doses of $\cdot 5$ gram it produces notable antipyretic effects analogous to those of antipyrine. It is stated to combine the effects of the latter with those of iodides.

The name *iodoantifebrin* is applied to an iodine derivative of antifebrin, prepared from paraiodoaniline. It forms colourless and tasteless rhombic plates soluble in water, alcohol and ether. As an antipyretic it appears to have proved a failure.

Methylphenacetin, a New Narcotic. (*Pharmaceutische Zeitung*, July 9, 427.) This new narcotic is obtained by adding to a boiling solution of para-acetphenetidin in xylol the calculated quantity of sodium, and treating the resulting sodium compound, which forms under evolution of hydrogen and separates in white needles, with methyl iodide, the products being methylphenacetin-sodium iodide and an undescribed compound. The sodium iodide is separated by filtration, the xylol removed by a current of steam, and the residual oil dried and finally distilled either under ordinary pressure or in a vacuum. Between 295° and 305° C. it passes over as a colourless oil, which solidifies on standing. By spreading it upon earthenware plates, or by pressure, the crystalline mass is freed from an adherent oil consisting of the by-product mentioned, and is then recrystallized from ether or alcohol. Obtained in this way methylphenacetin is described as occurring in colourless crystals, moderately soluble in water and freely in ether.

Sulphaldehyde as a Hypnotic. Prof. Lusini. (*Nouv. Rem.*, November 8, 1890, 500.) In experiments on frogs and rabbits, sulphaldehyde (thialdehyde) was found to induce soothing sleep, without any symptoms of excitement. In consequence of its slight solubility the hypnotic effects did not supervene until some time after its administration, but it acted more powerfully than paraldehyde, 0.010 gram of sulphaldehyde sufficing to narcotise a frog of average size equally with 0.025 gram of paraldehyde. Sulphal-

dehyde is entirely eliminated by the urine, which is characterized by its peculiar odour.

Sulphaldehyde is obtained in the form of an oil having a strong disagreeable odour by the action of sulphuretted hydrogen upon an aqueous solution of ethyl aldehyde.

Sulphonal, Paraldehyde and Chloralamide. (From *Brit. Med. Journ.*) The Therapeutic Committee of the British Medical Association has drawn up a report as to the comparative utility of different hypnotics. The points especially dealt with are: (a) the dose of the drug given; (b) whether sleep is produced with certainty, how soon it comes on, and how long it continues; (c) the production of dangerous or other disagreeable effects; and (d) whether the drug loses its effect. The following is a summary of results, obtained with sulphonal, paraldehyde and chloralamide:—

Sulphonal.—1. *Dose*.—In thirty-two of the cases recorded, 20 grains were given in eleven instances, once at night. Sleep came on in half an hour to three hours, in one case in five hours, and in another in nine hours. A second dose on the succeeding night in one case produced sleep in five minutes. Sleep lasted in four cases all night; in four cases six hours; and in three cases one to two hours. With 25 grains (four cases) sleep came on in two hours and lasted six hours or all night. With 10 and 15 grains there was less sleep produced, and in a case of pneumonia (15 grains) there was no sleep after the drug. The few cases (seven in all) in which 30, 40 and 60 grains were given, showed that these doses did not possess greater hypnotic effect than a dose of 20 grains. In a case of chronic gout 30 grains had no effect.

Disagreeable After-Effects.—In six out of ten cases in which 20 grains had been given, disagreeable after-effects were noted. Drowsiness next day was noted six times; giddiness four times; and headache and inco-ordination of gait each twice. In four cases where 10 grains had been given drowsiness was noted once; in five cases with 15 grains drowsiness was noted twice and giddiness twice; with 25 grains (four cases) drowsiness was noted twice, giddiness once, and headache once. In seven cases, with 30 to 60 grains, drowsiness was noted four times, giddiness twice, headache twice, inco-ordination of gait and vomiting each once.

Whether the Drug loses its Effect?—Several of the cases showed that a second dose on the succeeding night has a greater effect than on the first night. Thus, in one case, 20 grains produced on the first night two hours' sleep with no bad after-

effects; on the second, a similar dose produced eight hours' sleep with drowsiness, giddiness, and inco-ordination of gait on the following day. In some cases prolonged use of the drug appears to diminish its effect. Thus, in one case (asthma and bronchitis) 20 grains were given every other night for eight weeks. During the first fortnight sleep came on in an hour and lasted twelve hours each night. The drug was then omitted for a week, when the insomnia returned. In the succeeding five weeks the drug, after three hours, produced six hours' sleep. In a case of phthisis 20 grains were given every other night for twenty-six days, except for five days, when the dose was reduced to 10 grains, but afterwards was increased. During the time the patient was taking 20 grains, after an hour, he slept for four to six hours. The drug was omitted for a fortnight, and, on recommencing it, it produced only drowsiness, and no sleep. In a case of neurasthenia and insomnia, quoted by Mr. Priestley, sulphonal, 10 to 20 grains, did not lose its effect during six months.

Paraldehyde.—Single doses of 40 to 60 minims (fourteen cases) produced sleep in five to fifteen minutes; in two cases in half an hour; in one case in an hour. In most cases the sleep was wakeful and restless, and lasted very varying times, in one case only three-quarters of an hour, in another case there was restless dozing for three hours, in another sleep for two hours; in ten cases sleep lasted from three to six hours, and in one case sleep for twelve hours. These results refer to single doses. Half a drachm every three hours produced within half an hour two hours' sleep; 20 minims every four hours for fourteen days produced better sleep at night, but not during the day.

Disagreeable After-Effects.—Giddiness and drowsiness were noted each once, vomiting three times, and retching and nausea each once.

Tolerance of the Drug.—In a case of mitral stenosis on two nights 40 minims gave two to five hours' sleep; on the third night a similar dose had no effect; on the fourth night 1 drachm was satisfactory, but on the sixth night it produced no effect. When the paraldehyde failed it seemed to produce slight excitement. Morphine succeeded well afterwards.

Chloralamide.—In one case 20 grains, and in six cases 30 grains, were given in single doses. After the 20 grains sleep came on in twenty minutes and lasted three hours, with half an hour's interval of waking; after 30 grains, sleep came on in fifteen minutes to half an hour (four cases), one to two hours (two

cases). Sleep lasted all night in three cases, in two cases four to five hours, and in one case there was two hours' dozing, then an interval of wakefulness, and then two hours' sleep.

Disagreeable After-Effects.—None observed.

Tolerance of the Drug.—Thirteen consecutive observations were made in a case of pernicious anæmia, with several weeks' insomnia. Thirty grains of chloralamide failed once on the ninth night; on the other nights the drug produced, in one to two hours, restless sleep, lasting all night, with two or three short intervals of wakefulness.

Toxic Effects of Exalgin. E. E. Dyer. (*Brit. Med. Journ.*, August 30, 1890.) The author reports a case in which the administration of $2\frac{1}{2}$ grain doses of exalgin three times a day was followed by symptoms resembling those due to carbolic acid poisoning. The symptoms disappeared after the administration of the exalgin was discontinued. In all six doses had been taken.

Physiological Action of Hydrazine. O. Loew. (*Ber. der deutsch. chem. Ges.*, xxiii. 3203–3206). Hydrazine exerts an extremely poisonous action on organisms of the most varying description. In a solution containing, in addition to food substances, 0.2 gram of hydrazine sulphate per litre, the shoots of the helianthus and of barley were rapidly killed. Algæ, fission organisms, moulds, *Schizomycetes*, and lower water organisms were also rapidly destroyed by its dilute solution. A dose of 0.1 gram of hydrazine sulphate neutralised with sodium carbonate, and administered subcutaneously to a guinea-pig, caused death in $2\frac{1}{4}$ hours, and a dose of 0.5 gram, administered to a puppy in a similar manner, brought about the same result in $2\frac{1}{2}$ hours.

The Pharmacology of the Cocaine Group. P. Ehrlich. (*Deut. Med. Wochenschr.*, 1890, 717. From *Pharm. Journ.*) The author has carried out his experiments upon mice and found the most characteristic feature of cocaine poisoning to be the formation of numerous vacuoles containing serous fluid in the cells of the liver, causing an enormous increase in its size. The products obtained by the introduction of only an alcoholic group or an acid radicle into ecgonine were found to possess not only a far less toxic action than cocaine, but also the characteristic appearance of the liver was absent. On the other hand, higher esters of benzoylecgonine produced results similar to or even more marked than its methyl ester, cocaine, so that although it appears necessary that an ester and an acid radicle shall be present in the molecule in order to produce the specific action of cocaine, yet the

nature of the ester is of little importance. Greater interest was attached to the determination of the value of the acid radicle on account of Filehne's theory that the anæsthetic action of cocaine is due solely to the benzoyl group, and the observation of Liebreich that isotropylcocaine is a heart poison, and does not produce anæsthesia. The author found that cocaines containing different acid radicles all call forth the same pathological and anatomical change in the liver, and that this biological reaction is therefore a safer criterion for bodies of the cocaines group, *i.e.* ecgonine-esters containing an acid radicle, than their anæsthetic function. Since the latter is only possessed by cocaines containing certain acid radicles, the author proposes to call these radicles "anæsthesi-phores." The author has also experimented with the "homococaine" of Einhorn, a lower homologue of cocaine obtained by careful oxidation of the lactic acid residue in ecgonine to an oxyacetic acid residue and esterification and benzoylizing of the product. He endorses Einhorn's statement of its high anæsthetic property, and states further that its toxicity is at least as great as that of cocaine, so that it is evident that lactic acid residue in cocaine can be replaced by lower or higher homologues without alteration of the nature of the biological reaction of the product.

The Pharmacology of the Cocaine Group. E. Poulsson. (*Archiv. Path. Pharm.*, xxvii. 301.) The author publishes the results of his studies on the local and general action of homococaine and benzoylhomococaine. In ascertaining the local action the author experimented upon eyes of rabbits, cats and dogs, but his further experiments were made upon frogs (*R. temporaria* and *R. esculenta*). He has arrived at conclusions similar to those of Dr. Ehrlich that neither the substitution of an oxyacetic for a lactic acid residue, nor the employment of different esters of benzoyl-ecgonine, produces any important change in the local or general action of the bodies, and that non-etherified products do not possess anæsthetic properties, whilst the poisonous character in them is altered and weakened. In a note the author mentions that dextro-cocaine (see *Pharm. Journ.*, xx. 790, 889) has the same biological action as ordinary lævo-cocaine, but that he found it to act more quickly and intensely and for a shorter period.

Physiological Action of Cocaine. U. Mosso. (*Pflüger's Archiv*, xlvii. 553-601. From *Journ. Chem. Soc.*) Cocaine applied locally to a motor nerve paralyzes it; it also acts injuriously on the nerve-cells of the spinal cord. It has been supposed that cocaine acts on the sensory nerves, as curare does on the motor nerves, but

the present experiments do not entirely support this view; cocaine has no specific action, but its effects are similar to those produced by the application of cold to the nervous system.

In an animal in which a large part of the spinal cord remains intact while the rest is poisoned with cocaine, sensibility is lost after mobility; cocaine, therefore, arrests the outward impulses of the cord.

Regarding doses, the following are the numbers obtained from experiments on dogs:—0·0005 gram per kilo. of body weight produces no action on the muscles; 0·001 gram produces increased contraction; 0·003 acts in the opposite way. This action of the drug on the motor apparatus seems to have been missed by previous observers, because attention has been, as with other anæsthetics, more particularly directed to its influence on sensibility; the great advantage of cocaine as an anæsthetic appears to be due to the fact that it is completely destroyed in the organism; its effects soon pass off, and leave no bad after-effects.

Experiments on human beings gave the following results:—Doses of 0·1 gram given by the stomach increase the capacity for muscular work; if it is injected into the blood, there is first increased then lessened excitability of the motor apparatus as in animals. The beneficial action of cocaine is even greater in proportion when the muscles have been previously fatigued, or the individual has been fasting; in the latter case the work may be as much as doubled. This was tested graphically by recording the contraction of the fingers, the muscles of which were stimulated electrically; after a long march, fatigue does not ensue so readily with as without cocaine. Small doses (0·05 gram to 0·1 gram given by the mouth) increase the sensibility of the skin, and shorten the period of reaction. The drug increases the quantity of air inspired, even irrespective of any rise in the frequency of respiration; small doses cause marked contraction of the blood-vessels.

It increases the body temperature in frogs. Very small doses increase, larger ones stop, the patella tendon reflex. The intensity of the action of cocaine differs in different classes of vertebrates. In plants, as tested by the growth of seedlings, small doses promote, larger ones paralyse, the vital processes.

Action of Opium and Morphine. W. Spitzer. (*Brit. Med. Journ. Epitome*, 1891, 134.) The experiments were carried out on rabbits, frogs, and men, their object being to throw further light upon the action of opium on the intestine, and to determine

whether opium is better than morphine as an anti-diarrhœic and anodyne. In frogs, the bowel was exposed and kept moist with saline solution. Very small doses of aqueous extract of opium given subcutaneously sufficed to diminish the sensitiveness of the bowel to painful stimuli, whilst leaving intact the sensitiveness to stimuli which excite peristalsis. The sensitiveness of the skin was also not affected, nor was there any general narcosis. The conclusion is drawn that the action of opium cannot under these circumstances be on the brain, as the same result is obtained with headless frogs; nor on the spinal cord, as its other functions are intact, but on the bowel locally. The local action of opium was also shown by giving a frog strychnine; then tying the intestine midway between the stomach and anus, opium was injected into the lower half, and its power of calling forth convulsions on stimulation was thus markedly diminished. The opinion is held that opium paralyses not the sensory endings, but sensory ganglia on the course of the sensory nerves in the wall of the canal. The motor ganglia are not so readily affected, larger doses being necessary to lessen peristalsis.

The diminution of peristalsis may be due to paralysis of motor ganglia in the bowel, or to a stimulation of the inhibitory centres in the cord from which the splanchnic nerves arise. Paralysis of the sensory nerve terminations in the wall of the intestine does not occur, because after very large doses of morphine the peristaltic movements of the bowel become very marked, and experiments pointed to the conclusion that the diminution in peristalsis was very largely due to an action of the opium in paralysing the motor ganglia in the walls of the intestinal canal. Large doses caused great increase of bowel peristalsis before general spinal tetanus was induced. This is probably due to paralysis of the spinal cord, and consequent paralysis of the inhibitory action exerted by the splanchnic nerves. In this condition, however, the sensitiveness of the intestine to painful stimuli is much diminished. Morphine has the same action in every way, and quantitatively the activity of the opium is proportional to the amount of morphine it contains. The other alkaloids of opium have very little action on the bowel. On rabbits, observations were made after exposing the bowel while the animal lay in a warm bath of saline solution. The experiments of Nothnagel are confirmed, in which he found that irritation of the bowel with sodium chloride is not nearly so effectual in increasing peristalsis after the administration of opium or morphine. If a portion of bowel be completely isolated and the same experiment

repeated, then peristalsis is not interfered with; this result is regarded as proving that in this case the opium acts on the spinal cord, and diminishes the inhibitory action of the splanchnic nerves. It is, however, pointed out that irritation of the bowel from without with sodium chloride scarcely corresponds with physiological peristalsis or increased peristalsis after purgatives or irritation from within of the mucous membrane, as the peristalsis takes place towards the pylorus, and is very inconstant in amount. The bowel was therefore irritated by injecting into it a 15 per cent. solution, coloured with indigo-carmin. The rate at which this solution progressed down the intestine was observed in normal animals, and was found to be two or three times slower after opium or morphine, the peristalsis being also much more gentle and regular in the latter case. Even after complete isolation of a portion of the intestinal canal from its mesenteric nerves, opium greatly diminishes the peristalsis. Opium given subcutaneously acts exactly to the same extent, and no better than, morphine subcutaneously, its activity being proportional to the amount of morphine it contains. In healthy men, opium by the mouth acts somewhat differently on the bowel than when given subcutaneously; probably, the morphine is only slowly abstracted from the opium, and thus acts gently along the whole length of the bowel; it is not so quickly absorbed as pure morphine is, and in consequence does not produce so marked a general action. In diarrhoea, opium taken by the mouth is more powerful than opium extract or morphine subcutaneously, or morphine by the mouth. In slight intestinal pain, opium by the mouth is the best treatment, as the desired analgesia is produced with small doses and without constitutional effect, the local action on the bowel being probably sufficient; in very severe pain, hypodermic injection of morphine is most effectual.

Physiological Action of Morphine and its Derivatives. R. Stockman and D. B. Dott. (*Journ. Chem. Soc.*, October, 1890. From *Brit. Med. Journ.*) A medium dose of morphine first depresses the spinal cord, and this is followed by tetanus. When a minimum narcotic dose is given, the narcosis is not deep, and no tetanic symptoms follow. When the dose is sufficient to produce both sets of symptoms, the morphine is slowly absorbed, and only a small portion reaches the cord at first; hence the depression; as more is absorbed, more comes in contact with the nerve cells, and then tetanus occurs. Tetanus can, however, be induced at once without any preliminary depression if the morphine be thrown directly into the circulation so as to reach the cord in sufficient quantity.

The usual sequence of depression and stimulation is thus entirely a matter of dosage.

Methylmorphine, ethylmorphine, and amylmorphine have identical physiological actions, the narcotic action of morphine being diminished and its tetanic action increased.

Acetyl-, diacetyl-, benzoyl-, and dibenzoyl-morphine have a much greater depressant action in small doses on the cord and on the respiratory centre than morphine; their narcotic action is not nearly so profound. Increase of dose, instead of deepening the narcosis, brings on tetanic symptoms which are much more marked than those produced by morphine.

Morphine Sulphuric Ether and Nitrosomorphine.—In these two substances, the introduction of the radicles HSO_3 and NO modifies the action of morphine much in the same way as the introduction of alcoholic and other acid radicles.

Methylmorphine Chloride and Methylcodeïne Sulphate.—From experiments with these two additive products, the conclusion is drawn that the actions of morphine or of codeïne are not very profoundly altered by the chemical change. The paralysing action on the motor nerves is considerably increased, and the narcotic action is lessened.

Chlorine-derivatives of codeïne and morphine have the characteristic actions of the morphine-group on the central nervous system. In addition, they act energetically as muscle poisons, soon destroying the contractile power of the voluntary muscles with which they first come in contact at the place of injection, and more gradually affecting the other muscles of the body.

Methocodeïne.—In this substance, two methyl molecules are introduced into morphine, one replacing a hydroxyl hydrogen-atom, whilst the other is introduced into the body of the morphine molecule, $\text{C}_{17}\text{H}_{17}\text{MeNO}(\text{OH})\text{OMe}$. Here the distinguishing features of morphine poisoning are wholly absent, the chief symptom observed being gradual poisoning of the voluntary muscles.

Apomorphine, which is frequently described as morphine from which the elements of water have been removed, is thought to be probably a much more complicated compound, in which the atoms in the molecule have undergone complete re-arrangement. It is a muscle poison only, resembling methocodeïne in physiological action.

The experiments carried out in this research were performed on frogs and rabbits.

Apomorphine and Apocodeïne as Expectorants. W. Murrell (*Brit. Med. Journ.*, February 28, 1891.) The author reports that

the quantity of apomorphine tolerated by the stomach is much larger than has been generally supposed, and that he has given the hydrochloride of this base in doses of half to 2 grains with great success as an expectorant in cases of chronic bronchitis. As a proof that the preparation employed was an active one, he mentions that a patient, with whom one-sixth of a grain applied hypodermically produced violent sickness, could take internally four-fifths of a grain three times a day without the slightest inconvenience. According to his experience, a 1 to 50 solution of the hydrochloride of apomorphine keeps very well. The salt may also be given in the form of pills.

The author has found apocodeine hydrochloride to act as a powerful expectorant when given in the form of pills, and states that 3 to 4 grains may be administered daily with perfect safety.

Physiological Action of Thebaine, Narcotine, and their Derivatives. R. Stockman and D. B. Dott. (*Brit. Med. Journ.*, i. 1891, 157-159.) In continuation of the authors' previous research (see p. 242) certain other opium alkaloids and some of their derivatives were studied.

Thebaine (vinyl ether of morphine, $C_{17}H_{18}(C_2H_3O)NO_2$, Grimaux), in its physiological action, belongs to the morphine group. It stands, however, at its extreme limit, and more closely resembles strychnine than morphine; a slight preliminary narcotic stage, observed after small doses, stamps it, however, as somewhat different from strychnine.

Methylthebaine Sulphate, $(C_{19}H_{21}NO_3CH_3)_2SO_4$, is obtained by adding methyl iodide (1 mol.) to thebaine, and decomposing the iodide formed with silver sulphate. Its crystals are colourless, and freely soluble in water. From experiments on frogs and rabbits, the conclusion is drawn that the physiological action of the drug is not very different from that of thebaine; its tetanising power is, however, diminished, and its paralysing action on cord and motor nerve terminations is increased.

Narcotine, $C_{23}H_{23}NO_7$, *cotarnine*, $C_{12}H_{13}NO_3$, and *hydrocotarnine*, $C_{12}H_{15}NO_3$, were also examined. These also all belong physiologically to the morphine group, their chemical differences altering their action in degree but not in kind.

Physiological Action of Hyoscine Hydrochloride. M. Pavloff. (*St. Petersburg Med.-chi. Acad. Dissertations*, No. 9, 1889-90. From *Journ. Chem. Soc.*) From experiments on warm-blooded animals with doses varying from 0.00005 grain to 0.02 gram per kilo. of body weight, it was found that the pulse is first retarded

from stimulation of the inhibitory apparatus. It is then quickened from a paralysing action on the peripheral inhibitory apparatus. The blood pressure is increased by stimulation of the vaso-motor apparatus, especially the centres in the brain and spinal cord. The respiratory centre is stimulated to a slight extent by large doses. The salivary secretion is diminished. The temperature is not altered. The acidification of the blood is not hastened. The irritability of the brain is diminished. The sense of touch is not affected, although the perception of pain is somewhat diminished. The pupils are quickly, markedly, and persistently dilated from stimulation of the sympathetic nerves. The pharmacological action is very similar to that of atropine, but the latter does not lower the irritability of the brain cortex.

Physiological Action of Pituri and Nicotine. J. N. Langley and W. L. Dickinson. (*Journ. Physiol.*, xi. 265-306.) The bulk of this paper is taken up with a very complete account of the physiological action of the two drugs on frogs and mammals. The main result of the authors' experiments is to show that the physiological action of pituri is identical with that of nicotine. They regard the presence of this base in pituri leaves as certain, but consider it quite possible that the latter may also contain some other alkaloids besides.

Therapeutic Properties of Salicylate of Cinchonidine. Dr. McCall. (*Chem. and Drug.*, September 13, 1890. From *Medical News*.) The author has obtained very favourable results with salicylate of cinchonidine in cases of obscure rheumatism and neuralgia. The characteristics of the disorders are pain or soreness and stiffness of the loins, with or without impairment of function of the smaller joints. He gives particulars of several cases, in which speedy and seemingly permanent relief was achieved by the use of the salicylate in doses of 4 or 5 grains every three or four hours. Some of the patients had suffered for years from persistent pain in the back, from which they were unable to find relief by previous treatment, including sodium salicylate in conjunction with quinine.

Physiological Action of Lupetidine and Allied Substances in Relation to their Chemical Constitution. A. Gürber. (*Chem. Centr.*, 1891, i. 232-235. From *Journ. Chem. Soc.*) The series of substances, copellidine, parpevoline, propyllupetidine, isobutyllupetidine, and hexyllupetidine have for their nucleus piperidine, of which lupetidine is a dimethyl substitution product; and if the hydrogen atom adjacent to the nitrogen atom is replaced by methyl,

ethyl, etc., further members of the group are obtained. Small doses of these substances were administered to animals. The intensity of their action (paralysis of the voluntary muscles) may be compared by the following numbers: lupetidine, 50; copellidine, 100; parpevoline, 200; hexyllupetidine, 200; isobutyllupetidine, 250; propyllupetidine, 400. The actual seat of paralysis, whether central or peripheral, was not definitely determined. The intensity of the action is proportional to the number of methyl groups present in the molecule.

The Physiological Action of Methyl-Strychnine. J. Tillie. (*Journ. Anat. and Phys.*, xxiv. 509. From *Pharm. Journ.*) The author records the results of some experiments on the action of methyl-strychnine as compared with that of curarine. He finds that in the relative order and strength of the paralysing and tetanising action of the former it resembles curarine rather than strychnine. Like curarine it possesses a tetanising action which is delayed and diminished whilst the paralysing action exercised by strychnine on motor nerves is hastened and increased. Thus after the administration of methyl-strychnia to frogs the paralysing action was manifested in a few minutes, whilst the tetanic action did not appear until from one to two hours afterwards, the relative length of the time depending upon the readiness with which the poison can reach the spinal cord, according to the mode of injection.

Physiological Action of Thialdine and Carbothialdine. Prof. Lusini. (*Pharm. Journ.*, 3rd series, xxi. 471.) The author reports that carbothialdine acts powerfully as a tetanising agent, and never causes irregularity in the action of the heart, which it arrests in diastole. Thialdine, on the other hand, acts as a general paralysing agent, its administration being always followed by irregularity in the action of the heart, which it generally arrests in systole.

Thialdine is produced by the action of ammonia upon trithialdehyde, an atom of sulphur being displaced by the imide group (C_2H_4)₃S₂NH. It occurs in large aromatic crystals, melting at 43° C., volatilizing without decomposition at the ordinary temperature, slightly soluble in water, but freely in alcohol, ether and acids.

Carbothialdine, $CS \begin{cases} NH_2 \\ SN(CH \cdot CH_3)_2 \end{cases}$ is produced by the combined

action of ammonia and carbon bisulphide upon aldehyde. It occurs in small crystals, insoluble in hot water or ether, slightly soluble in cold alcohol and freely soluble in hot; it is decomposed by boiling water.

Phloridzin Diabetes. F. Moritz and W. Prausnitz. (*Journ. Chem. Soc.* From *Zeit. Biol.*, xxvii. 81-118.) The authors have discovered in phloridzin an agent by means of which diabetes can be artificially produced in animals. Phloridzin is a glucoside, which, by boiling with an acid, is decomposed, yielding a sugar phlorose, which is almost identical with dextrose, and phloretin, which, by the action of caustic alkali, is split into phloroglucinol and phloretic acid. The constitution of phloridzin is not known with certainty; phloretic acid, however, is the acid of an aromatic alcohol, and phloroglucinol is a trihydric aromatic alcohol or phenol. It is probable that phloridzin contains free aromatic hydroxyl-groups. It therefore was necessary in the course of the investigation to determine the amount of ethereal hydrogen sulphate in the urine in addition to the sugar. The results of these experiments and others bearing on the influence of the drug on metabolism and other points may be thus stated:—

The phloridzin used was pure: it yielded phloretin which crystallized in needles melting at $226-230^{\circ}$, thus differing from that originally described by Stas, which crystallized in plates melting at 180° . A simple reaction for phloridzin is the red colour produced on evaporating it with a few drops of a solution of vanillin in alcohol, and a little hydrochloric acid. Iron chloride gives a brown coloration with solution of phloridzin. Neither of these tests, however, can be used for its identification in fæces, as they are not characteristic. Phloridzin may be best detected and estimated by the yield of sugar produced after hydrolysis with sulphuric acid. The absorption of phloridzin in the alimentary canal appears to be rapid and complete. After feeding an animal on the drug in doses of 1 gram per kilo. of body weight, it is not recognisable in the fæces. For a space of two days on the average after the administration of the drug, the urine contains a substance which gives a brown coloration with ferric chloride. The urine also contains an increased quantity of ethereal hydrogen sulphates on the day of the dose, and the succeeding day; the increase is so marked that it is only explicable on the ground that part of the phloridzin given is combined in the urine as a sulphate. The following table represents the result of an experiment on a dog, bearing out this statement:—

Date.	Sulphuric Acid.			Remarks.
	As normal sulphate (a).	As ethereal sulphate (b).	a : b.	
24th Nov.	0.69	0.14	1:0.2	Normal.
4th Dec.	0.85	0.11	1:0.13	Normal.
6th Dec.	0.21	0.41	1:2.0	6 gr. of phloridzin given.
7th Dec.	0.66	0.22	1:0.34	

The excretion of phloridzin, and the accompanying glycosuria, appears to be completed within the second day after its administration. The total quantity of sugar in the urine is far greater than can be accounted for by the phlorose derived from the drug itself; it is a form of sugar which completely disappears under the influence of yeast, and is thus dextrose, doubtless mixed with phlorose.

Phloretin also causes glycosuria, but not so markedly as does phloridzin. Phloroglucinol and phloretic acid do not produce this result. Phloridzin diabetes is analogous to the most severe form of human diabetes; it occurs whatever the diet may be: meat, carbohydrate, or fat, or mixtures of these, or when no food is given at all. The excretion of sugar begins about three hours after the drug has been given, rises quickly to a maximum, and as rapidly falls; this corresponds to the rate of absorption and excretion of the drug. The percentage sugar contents of the urine varies greatly. A minimum of 6 per cent. and a maximum of 13.5 per cent. were observed. It varies with the amount of phloridzin given, and also with the amount of food taken. In this latter particular an increase of meat in the diet produces a more marked effect than an increase of the carbohydrates; this is, probably, dependent on the slower absorption of starch. If one calculates the maximal amount of sugar theoretically possible from the food, after allowing for the carbon discharged as urea, it is found that the quantity of sugar in the urine is much less, but in the case of meat diet is greater than in the case of starchy foods. The output of sugar during hunger and during a fatty diet is very great, relatively much greater than when carbohydrates and meat are taken. The destructive metabolism of proteids during an abundant meat diet is only slightly increased by phloridzin; this is very different from what occurs during inanition, then the nitrogenous output may be twice that of the

normal; the increase is not so marked when fat is given as during absolute abstinence from food; carbohydrate food lessens the increase still more.

Cadaverine and the Treatment of Cholera. R. Kobert. (*Pharm. Centralhalle*, March 19, 1891, 162.) Cadaverine ($C_5H_{14}N_2$), which was first isolated from the human corpse by Brieger, has subsequently been detected in the urine of patients suffering from cystinuria, and occurs among the products of cultivations of the cholera bacillus. In the opinion of the author of this paper the danger of this compound to human patients may be considerably lessened by its conversion into a neutral salt. He therefore favours the treatment of cholera by the administration of acid drinks and washing of the intestines with acid liquids, especially as it has been shown that the cholera bacillus itself is affected by traces of acid.

Therapeutic Action of Agaric Acid. M. Combemale. (*Bul. Gén. Thérap.*, May 30, 433; *Pharm. Journ.*, 3rd series, xxi. 1170.) Hofmeister has already drawn attention to the value of white agaric called *Polyporus officinalis*, and its acid principle for the relief of night sweats. The author of the present paper reports on seventeen cases of this kind. The conclusion drawn from the results is that agaric acid exercises with certainty a restraining action upon the sweats of pulmonary tuberculosis as well as those that accompany other forms of infection. The dose of 2 centigrams *pro die* was found sufficient to produce the desired effect, but it is recommended to make certain by commencing with the full dose of 4 centigrams daily. No serious or inconvenient symptom was observed in any case where the integrity of the intestinal canal was not affected. The antisudoral action commenced two hours after ingestion and lasted for six hours; no indication of accumulation or of the system becoming irresponsive to the remedy were observed to follow repetitions of the dose for several days. Agaric acid occurs as a white, silky crystalline powder, without odour or taste, and melting at 138° to 139° C. It is soluble in alcohol, but very slightly soluble in ether, acetic acid and cold water. Its irritant action renders it unsuitable for subcutaneous injection, and the author considers the pilular form the most convenient for administration.

Physiological Effects of Cetrarin, the Bitter Principle of Iceland Moss. R. Kobert. (*Pharm. Zeit.*, August 13, 1890, 504.) Cetrarin, in moderate doses is found to favour peristaltic action and to prove beneficial in cases of chronic constipation. It acts

as a mild stimulant upon the central nervous system and seems to possess the power of increasing the number of both the red and white blood corpuscles, especially where these are deficient in consequence of illness. It therefore acts as a valuable blood tonic, and in doses of 0.1 gram is a useful remedy in cases of anæmia associated with loss of appetite, languor and constipation. The opinion that cetrarin exercises an increasing action on the blood pressure is not borne out by the author's experiments.

Sugar of Milk as a Diuretic. Dr. Zawodski. (*Deutsche Med. Zeitung*. From *Amer. Journ. Pharm.*, December, 1890.) The diuretic action of milk sugar observed by Professor Sée is confirmed by the author, who has employed it in a severe case of dropsy, with excellent results. He made no change in the diet of the patient and allowed him to take fluids. The dose was from 12 to 18 grams a day, given with a considerable quantity of milk containing itself at least 50 grams of milk sugar. The author thinks that this substance deserves to occupy a prominent place among diuretics.

Therapeutic Properties of Ethylene Bromide. J. Donath. (*Wiener Med. Bl.*, 1891, 279.) The author recommends this preparation as a remedy for epilepsy; in doses of 0.1 to 0.3 gram three times a day. Owing to its insolubility in water it should be given in the form of an emulsion, or in an alcoholic solution largely diluted with milk before taking, or in gelatin capsules with oil of sweet almonds.

Mercuric Chloride in Diphtheria. F. A. Coward. (*British Medical Journal*.) This remedy was tried in sixty cases, all of which proved successful. His formula for a child of three years and upwards is:—

Tr. fer. perchlor.	. . . . .	3j.
Liq. hyd. perchl.	. . . . .	3j.
Glycerin. ad	. . . . .	3ij.

Dose. A dessertspoonful every hour from four to six hours, and then every two, three, or four hours, as the case may require.

For an adult he gives:—

Tr. fer. perchlor.	. . . . .	3ij.
Liq. hyd. perchl.	. . . . .	3j.
Glycerin. . . . .	. . . . .	3ss.
Sol. potas. chlorat. ad	. . . . .	3viiij.

Dose.—3j. each hour, and repeated as in the case of the child.

Therapeutic Properties of Sodium Tellurate. P. Combemale. (*American Druggist*, July 15, 1891. From *Gaz. Thérap.*) The author recommends tellurate of sodium in doses of not less than 0.05 gram ($\frac{3}{4}$ grain), to be given at night, as an efficient remedy against night sweat in phthisis, and some other diseases accompanied by profuse sweating. To mask its garlic-like odour and taste, it is recommended to be given in combination with oil-sugar of peppermint.

Physiological Action of Potassium Ferrocyanide. P. Combemale and M. Dubiquet. (*Comptes rendus Soc. Biol.* [9], xi. 169-172.) The authors find that in its passage through the system, the ferrocyanide is changed into the ferricyanide, which is eliminated in the urine. Its diuretic action appears to be connected with this transformation, and the simultaneous formation of diuretic potassium salts.

The Toxic Action of Uranium Salts. M. Woroschilsky. (*Pharm. Journ.*, 3rd series, xxi. 206.) Though the poisonous nature of uranium salts has long been known, the extreme character of their toxicity does not appear to have been generally understood. Their poisonous properties were first made known in 1824 by Gmelin, and were confirmed nearly thirty years later by Leconte, who mentioned as one of the most characteristic symptoms of poisoning by uranium the occurrence of large quantities of sugar in the urine. The latter observation is fully confirmed by the author of the present paper.

The exact symptoms produced by poisonous doses of uranium are as follows:—Severe gastro-enteritis follows its administration, while nephritis is induced by such small doses as 1-2 milligrams per kilo. of body weight. It is distinguished from other metallic poisons by acting directly even in very small doses on the walls of the blood vessels. This tendency seems connected with its specific action on the blood by causing the hæmoglobin to retain oxygen altogether abnormally, in which respect it resembles hydrocyanic acid. On the introduction of the poison into the circulation, the difficultly reducible oxyhæmoglobin, resulting from its action above mentioned, probably affects the walls of the blood-vessels in the same manner as venous blood and causes their dilatation. The failure of the oxyhæmoglobin under the influence of uranium salts to part normally with its oxygen, is also considered to account for the profound disorganization of the nutritive functions which ensues, and for the derangement of the nervous system, liver and kidneys which accompanies it. It is also said to explain

the general waste of tissue resulting in the emaciation of the animal under experiment, which was a characteristic symptom, and further elucidates the first noted pathological phenomenon, viz., the appearance of sugar in the urine, which is merely a sign of imperfect oxidation in the circulatory system, disappearing with the removal of the ultimate cause.

Physiological Action of the Soluble Salts of Strontium and Calcium. J. V. Laborde. (*Comptes rendus Soc. Biol.* [9], xi. 453-459.) While soluble barium salts are known to be highly toxic, strontium salts are found by the author to be quite innocuous. Calcium salts also appear to be harmless.

The Dermatological Value of Sulpholeate of Sodium. G. H. Fox. (From *Therapeutic Gazette*.) It is well known that when sulphuric acid is added slowly to any fixed oil or fat, care being taken to keep the temperature of the mixture below a certain point, a chemical combination results, the oleic acid being transformed into sulpholeic acid. If sulphuric acid and castor oil, *e.g.*, be mixed in the manner above stated, the result is a thick, viscid, brownish mass, with a strongly acid reaction. The chemical change must take place slowly, and to this end the mixture is kept cool and frequently stirred for about twenty-four hours, or until it is perfectly homogeneous and miscible with water. When the acid thus obtained is combined with an alkaline base, it yields a clear, thick, yellowish, semifluid mass of the nature of a liquid soap. Of the various alkalies, soda has been found to be the most serviceable in combination with the acid, and the preparation of sulpholeate of sodium is, in brief, as follows:—To the viscid mass formed by combination of the acid and oil a solution of carbonate of sodium is slowly added under constant stirring and the sulpholeate of sodium is formed. This mixture is allowed to stand for twenty-four hours in a funnel, with stop-cock attached, during which time two distinct layers are gradually formed, the upper one being the sulpholeate of sodium, which is at first held in suspension in the liquid, like cream in cow's milk. This substance has an acrid, bitter taste, and a nearly neutral reaction. Applied to the healthy skin, it has a bland oily or slightly sticky feeling. It contains about 30 per cent. of water, which can be readily separated by evaporation, and the mass then resembles vaseline in appearance and consistency, and makes an excellent basis for ointments.

The author considers that the value of sulpholeate of sodium, in the treatment of skin diseases, depends upon the following quali-

ties:—1, its miscibility with water; 2, its rapid absorption by the skin; 3, its remarkable solvent power. The ease with which anhydrous sulpholeate of sodium can be mixed with water, gives it an advantage over the fatty substances commonly used for application to the skin. It is this affinity for water which enables sulpholeate of sodium to sink into the skin more readily than vaseline or fatty substances. But the chief recommendation of sulpholeate of sodium is stated to be its remarkable power of dissolving certain substances for which there has hitherto been no available solvent. Sulphur, chrysarobin, and other drugs of great value in dermatology, have heretofore been applied to the skin in a finely triturated but undissolved condition.

There are three forms in which sulpholeate of sodium may be advantageously used in the local treatment of skin-disease; viz., as an ointment, liniment, or plaster. As a basis for ointments, the water must be removed by evaporation until a suitable consistence is attained. As this process necessarily involves time and trouble, the ointment thus prepared will be more expensive than those made with lard or petroleum as a basis, and in most cases will possess no corresponding advantage. As a liniment, employed for the purpose of conveying various medicaments into or through the skin, the hydrated sulpholeate of sodium has proved in the author's experience superior to other substances used for the same purpose. Mixed with gelatin in proper proportions and spread thinly upon muslin, sulpholeate of sodium yields a plaster which adheres readily to the skin when moistened, and is superior in many respects to other preparations of this kind.

Although, theoretically, the sulpholeate of sodium is a neutral substance, it is generally found to contain a small quantity of free acid, and may thus produce a slight amount of irritation when applied to a delicate or acutely inflamed skin. The author admits that in the treatment of acute infantile eczema, he has only met with disappointment, but in the use of all stimulating applications he has found sulpholeate of sodium to be a most useful vehicle.

The Solvent Action of Alcohol of Different Degrees of Strength on some of the Drugs used in Making Pharmacopœial Tinctures. E. H. Farr and R. Wright. (*Pharm. Journ.*, 3rd series, xxi. 857-860, 957-959, and 1037-1039.) The authors' investigation thus far is confined to the tinctures of conium, colchicum, and aconite. They find that in the case of tincture of conium, alcohol of 70 to 80 per cent. is the best menstruum for obtaining a tincture of maximum strength. A similar strength of alcohol (70 per

cent.) is recommended for tincture of aconite, while in the case of tincture of colchicum a menstruum of 50 per cent. was found to give the best result. A critical examination of the various modes of preparing these tinctures has led the authors to the conclusion that in all of three cases a process of continuous percolation without previous maceration is the most satisfactory.

The advisability of proceeding further in the direction of standardised tincture is well illustrated in the case of tincture of conium, which showed a variation in the yield of alkaloid ranging between .06 to .16 per cent.

The paper is full of interesting details, for which the reader is referred to the original.

Preparation of Tinctures. M. Vauthier. (*Répertoire de Pharm.*, May 10, 1891.) The apparatus used by the author in the preparation of tinctures consists of a wide-mouthed jar whose bottom is pierced with small holes, the perforated portion falling far enough below the shoulder of the larger jar as to become fairly well immersed in the alcohol with which the latter is filled, the smaller jar having previously received the iodine or resin to be dissolved; the charged portion of the solution goes to the bottom of the jar, leaving the unsaturated portion of the alcohol always in contact with the drug, thus insuring very rapid dissolution.

Tinctura Quinæ Ammoniata. H. D. Adcock. (*Pharm. Journ.*, 3rd series, xxi. 754.) The author suggests the following mode of manipulation:—

R Sulphate of quinine . . .	160 grains.
Solution of ammonia . . .	2½ fluid ounces.
Rectified spirit . . .	3xj and m 105.
Water to . . .	20 fluid ounces.

Rub down the quinine in a glass mortar to a fine powder, add the rectified spirit and stir; now add the solution of ammonia, then the water in small quantities at a time and filter.

When practicable, allow to stand for four days and then remove by filtration any deposit that may have formed. The resulting tincture is in exact accordance with the requirements of the Pharmacopœia.

Tincture of Nux Vomica. A. J. Dey. (*Pharm. Journ.*, 3rd series, xxi. 631-632.) The author examined eight trade specimens of this tincture with the following results:—

Sp. gravity.	B. P. standard.	Extract. 6·65 grains per oz.	Total alkaloid. 1·0 grain per oz.
1 . .	·899	5·11	1·30
2 . .	·988	5·96	1·35
3 . .	·990	5·82	1·31
4 . .	·902	5·68	1·97
5 . .	·893	5·68	1·60
6 . .	·901	5·40	1·55
7 . .	·896	5·68	1·2
8 . .	·930	6·53	1·45

The tinctures corresponded pretty closely in colour, 7 and 8 being decidedly paler than the rest. All of them are over the official standard, No. 4 being nearly twice the B. P. strength. The specific gravity varies a good deal. This is partly due to the quantity of extractive, but seems also due to the varying quantity of water in the menstruum. The quantity of extractive is in every case less than the official standard. The extract used in making No. 8 must have been very poor in alkaloid. These results taken in conjunction with those of Martin (*Year-Book of Pharmacy*, 1886, 507) tend to indicate that the attempt to standardise this tincture has so far been a failure. The author states that better results would be obtained by using a dry extract, as recommended by Duncan, or that it might be done by diluting a standardised fluid extract; but such processes would involve the trouble and expense of first making an extract and then dissolving it again in the menstruum. To avoid this he proposes to exhaust 1 ounce of powdered nux vomica with 15 fluid ounces of the official menstruum by percolation, to estimate the percentage of alkaloid in the percolate and then to dilute with sufficient menstruum so that the finished tinctures would contain 1 grain of total alkaloid per fluid ounce. He has satisfied himself of the feasibility of the latter suggestion by experiments.

Approximate Estimation of Alcohol in Tinctures. J. F. Liverseege. (*Chemist and Druggist*, March 14, 1891.) Place in a tall 250-grain graduated cylinder 50 grain-measures of the tincture, etc., to be tested and 200 grain-measures of ordinary methylated ether (sp. gr. 717). Shake, and allow to settle for five minutes; then read the volume of the lower layer, and refer to the table for the percentage of spirit.

Should the tincture be made with rectified spirit use a 500-grain cylinder, and take 50 grain-measures each of tincture and water and 400 of ether. After shaking and settling, measure the lower

layer, divide the volume by two, refer to the table, and multiply the strength of spirit by two. Glycerine should be absent or present only in small quantities.

Lower layer grain-measures.	Proof spirit per cent. by volume.	Absolute alcohol per cent. by weight.	Lower layer grain-measures.	Proof spirit per cent. by volume.	Absolute alcohol per cent. by weight.
2·5	122	62·1	25·0	92	44·9
5·0	119	60·3	27·5	88	42·5
7·5	116	58·5	30·0	84	40·1
10·0	113	56·7	32·5	79	37·7
12·5	110	54·9	35·0	74	35·1
15·0	107	53·1	37·5	68	32·3
17·5	103	51·2	40·0	62	29·3
20·0	100	49·2	42·5	56	26·3
22·5	96	47·1	45·0	50	23·3

To ascertain how much the dissolved matter in a tincture interferes with the method, the author estimated the alcohol in several commercial samples, both weak and of full strength :—

	Fluid grs.	Proof spt.
Tinct. rhei co., genuine, gave . . .	20 =	100 per cent.
" " " " " " . . .	17.5 =	103 "
" diluted sample . . .	40 =	62 "
" " " " " " . . .	45 =	50 "
Tinct. camph. co., three genuine ones, each gave	20 =	100 "
Tinct. camph. co., poor sample, gave	32.5 =	79 "
Tinct. camph. co., poor sample, gave	45 =	50 "

These results show that the extractive, etc., in these tinctures does not affect the result. In the following rectified-spirit tinctures the dissolved substances appear to render the estimation of the alcohol rather too high:—

	Fluid grs.	Proof sp.
Tinct. benzoin co., genuine gave	60 ÷ 2 =	168 per cent.
Tinct. benzoin co., weak sample, gave	75 ÷ 2 =	136 "
Tinct. benzoin co., weak sample, gave	85 ÷ 2 =	110 "
Tinct. iodi, two genuine, gave	60 ÷ 2 =	168 "
" one " "	62·5 ÷ 2 =	163 "
" weak sample "	85 ÷ 2 =	110 "
Spt. æther nit., genuine "	62·5 ÷ 2 =	164 "
" " "	65 ÷ 2 =	158 "
" weak sample "	75 ÷ 2 =	186 "

Infusion of Digitalis. F. Lascar. (*Chemist and Druggist*, January 3, 1891.) The author confirms the statement made by Brocker that infusion of digitalis made from leaves devoid of mid-rib and stalks is much more active than one made from entire leaves and stalks. Moreover, the latter is much more mucilaginous.

Gelatinization of Infusion of Digitalis. Dr. Forcke. (*Pharm. Centralhalle*, 1890, 626.) Infusion of digitalis is occasionally liable to become gelatinous. A study of this change by the author leads to the following conclusions:—

1. The change is in no wise depending upon the period at which the leaves have been collected.

2. The petioles are richer in pectinous substances than the leaves.

3. By prolonged heating of the infusion the pectin may become so modified, as to cause the change alluded to. This is attributed to a fermentation induced by micro-organisms from the air.

4. Gelatinization does not take place if the directions of the Pharmacopœia are followed, especially if the leaves employed are free from petioles.

Iron Wine. Vinum Ferri. B.P. J. A. Forret. (*Pharm Journ.*, 3rd series, xxi. 640.) The author has examined a number of trade specimens of the B.P. preparation with the following results:—

Sample.	Per cent. Fe.
A	·2016
B	·2016
C	·2688
D	·0896
E	·2016
F	·2912
G	·2800
H	·2352
I	·0224
J	·2688

A quantity of iron wine, as B.P., was put on and estimated each week with the following results:—

	p.c. Fe.
1 week	·2016
2 "	·3186
8 "	·3146
4 "	·2912
5 "	·1568
6 "	·1844

It will be seen that the wine ceased to take up iron at the third week, and then gradually became weaker. It was suggested that the wine ceased to act upon the iron on account of the coating which forms on the iron. To test this a small quantity of fresh iron was added at the fifth week, but on estimating at the sixth week, the dissolved iron was found to be still on the decrease.

The deposit from this wine is apparently of the same composition as that thrown down from wine made with the tartrate. The precipitate is insoluble in water, freely soluble in dilute hydrochloric acid, and contains both ferrous and ferric iron.

As *vinum ferri citratis* contains a definite quantity of an iron salt added to a *menstruum*, with which it forms a perfect and stable solution, the author suggests that it be called simply *vinum ferri*, and that the present indefinite, unstable, and inelegant iron wine be deleted from the next issue of the *Pharmacopœia*.

Extract of Belladonna. W. B. Cowie. (*Pharm. Journ.*, 3rd series, xxi. 631.) The author has examined six commercial samples of the alcoholic extract of belladonna. The process adopted consists in dissolving a definite weight of extract in acidulated water, removing colouring matter, etc., by shaking up with chloroform, rendering alkaline with ammonium carbonate, then extracting the alkaloid with chloroform, transferring the chloroformic solution to a tared beaker, evaporating the chloroform, and weighing. The results were as follows :—

							Per cent. total alkaloid.
No. 1	.	.	.	.	.	.	3.27
" 2	.	.	.	.	.	.	4.0
" 3	.	.	.	.	.	.	8.6
" 4	.	.	.	.	.	.	3.2
" 5	.	.	.	.	.	.	1.6
" 6	.	.	.	.	.	.	3.7

The author pleads in favour of a standardised extract.

Extractum Jalapæ Alcoholicum. J. E. Wishart. (*Amer. Journ. Pharm.*, September, 1890.) Two samples of jalap root were reduced to powder and 4 ounces of each extracted by percolation with alcohol of 95 per cent. The percolates were evaporated to the consistence of a soft extract over a water-bath, dried at 105° C., weighed, and then exhausted with distilled water at 15.5° C. The aqueous extract was evaporated, dried and weighed. The remaining resin was then treated with stronger ether and the quantity of the ether-soluble portion determined by evaporation and weighing. The results were as follows :—

Sample.	Alcoholic Extract.		Resin.	Resin Soluble in Ether.
	Total.	Water-Soluble Portion.		
1	14.583 per cent.	2.816 per cent.	11.666 per cent.	12.765 per cent.
2	15.625 "	4.239 "	10.386 per cent.	9.523 "

The resin was reddish brown in colour, No. 2 being of a darker shade; it had an acrid taste and a neutral reaction. A solution of one part in 50 parts of solution of ammonia did not gelatinize on cooling; on the addition of hydrochloric acid in excess a precipitate was produced.

Jalapurgin, the resin remaining undissolved by the ether, was brittle, reddish brown, of a sweetish, afterwards acrid taste, and of neutral reaction. It was soluble in alcohol, chloroform, and in potassium hydrate solution, the latter solution having a peculiar odour.

The ether-soluble resin was reddish brown, soft, did not harden on standing, and was soluble in alcohol and potassium hydrate, the latter solution yielding a precipitate on being acidulated with hydrochloric acid.

Resin of jalap was also prepared in accordance with the pharmacopœial process by exhausting the powders with alcohol, concentrating the percolate to a small bulk, precipitating with water, washing the precipitate and drying at 105° C. The amount of resin thus obtained was 9.79 per cent. from sample No. 1, and 8.75 per cent. from sample No. 2. The smaller yield by this process seems mainly due to the more complete removal of the extractive matter soluble both in alcohol and water.

Jalapurgin, as obtained above, when treated with potassium bichromate and sulphuric acid, took an olive-green colour, while the ether-soluble resin became at first yellowish brown, and subsequently changed to reddish brown. Treated with manganese dioxide and sulphuric acid, jalapurgin acquired a rose-pink, but the ether-soluble resin a dark green colour.

Extractum Cinchonæ Liquidum. M. C. Traub. (*Schweizerische Wochenschrift für Pharmacie*, 1890, 377. From *Amer. Journ. of Pharm.*) The author publishes an improved method for the preparation of this extract based on suggestions by De Vrij. The process consists in macerating for two days the powdered cinchona bark (100 parts) with a mixture of 10 parts of glycerine, 10 parts

of hydrochloric acid and 200 parts of water, then percolating, finishing with water until the percolate ceases to precipitate with sodium hydrate. The percolate is next distilled in a vacuum of 700 mm., at a temperature not exceeding 40° C. (regulated by placing the retort in a water-bath kept at 45° C.) until a syrupy liquid remains in the retort; this is removed to a tared vessel, the retort being rinsed with successive small portions of water until the total liquid weighs 90 grams; then 10 grams of alcohol are added, and the extract filtered. By the above process, change in the bark constituents is avoided and an extract obtained only slightly darker in colour than the bark used. A temperature of 65°–70° C., even in a vacuum, is sufficient to bring about decomposition of the cinchotannic acid.

Liquor Bismuthi, B.P. P. Boa. (*Chemist and Druggist*, September 20, 1890.) The author discusses the question as to the amount of liquor ammoniæ required to dissolve the 800 grains of bismuth citrate in making one pint of liquor bismuthi, B.P. He finds that 2½ fluid ounces of the liquor are generally sufficient for this purpose, and thinks that under no circumstances should the quantity used exceed 3 ounces.

Liquor Bismuthi et Ammonia Citratis. D. Gorrie. (*Pharm. Journ.*, 3rd series, xxi. 770.) In order to prevent this liquor from decomposing and becoming muddy from development of fungoid growth, the author suggests that the B.P. quantities should be made up to 19 ounces with the necessary water and solution of ammonia, and that finally one ounce of rectified spirit should be added. In his experience this addition makes the liquor keep indefinitely. Chloroform water might answer the purpose, but it possesses a sweetness and odour which may be found objectionable.

Since perfect freedom from colour in this liquor is best attained by preventing any rise of temperature during its preparation, the author proposes that the solution of ammonia be added in very small quantities at a time, always waiting till the liquor is cool before a further addition is made.

He finds that by attention to these points a practically perfect preparation is obtained.

Mistura Olei Ricini. M. Conroy. (*Chemist and Druggist*, January 3, 1891.) The author finds that the official directions given for this preparation do not produce a satisfactory emulsion, but that by slightly modifying the directions, and without altering the formula, a very good emulsion can be made as follows:—Mix

the oils in a mortar and incorporate the syrup. Mix the solution of potash with the whole of the orange-flower water (7 drachms and 18 minims), and add it *gradually* to the oils and syrup in the mortar, rubbing gently to form an emulsion.

In this way a thin, milky emulsion is readily produced, which assumes a thicker and more creamy appearance on keeping. It should be freshly prepared when required.

Pill Excipients. J. Findlay. (*Pharm. Journ.*, 3rd series, xxi. 594.) The author suggests some improvements in the excipients used for the following pill masses:—(1) Pil. aloes barb.; (2) Pil. aloes et myrrhæ; (3) Pil. aloes socot.; (4) Pil. plumbi c. opio; and (5) Pil. rhei comp. In the case of pil. aloes barb. and pil. aloes socot., he suggests the substitution of 1 fluid drachm of either compound decoction of aloes or fluid extract of liquorice for 1 ounce of confection of roses in the official formula. Four grains of such a mass would be equal to 5 grains of the official mass. As regards pil. aloes et myrrhæ, he proposes the omission of the glycerine and the use of 1½ ounce of treacle only. For the 6 grains of confection of roses in pil. plumbi c. opio, he suggests the substitution of 3 grains of fluid extract of liquorice. In the case of pil. rhei co. he proposes the use of 3 ounces of treacle and the omission of glycerine entirely. These alterations are stated to yield more satisfactory pill masses.

Pill Coating. D. Hughes Davies. (*Pharm. Journ.*, 3rd series, xxi. 597-598.) 1st. *The Gelatin Process.*—The author has obtained the best results by adopting the following plan,—

Gelatin	.	.	.	.	.	.	.	1 oz.
Water	.	.	.	.	.	.	.	8 ozs.

Dissolve at a gentle heat, then add the white of an egg, and heat until the albumen coagulates, strain through flannel into a water-bath kept at a low temperature, add glycerine ʒii, rectified spirit ʒii, and boric acid gr. vi. A perfectly clear solution is thus obtained. Instead of coating the pills singly as is generally done the author adopts the following more expeditious mode. He takes a rounded piece of thin wood with a thick layer of cork stuck round the edge, and a small hole in the centre through which passes a little ferrule, enabling him to place the whole on a small iron peg fastened to a wooden stand capable of holding several of such boards. The boards are provided with good needles firmly fastened in the cork to the number of six, twelve, twenty-four, and

forty-eight. The pills to be coated are attached to the points of the needles and dipped in the solution, taking care not to keep them in too long, as a thick coating is undesirable. The board with the pills on is placed back on the peg, revolving in a gentle manner to render the coating even, and giving it an occasional turn round. By coating the pills in the evening they are ready to be taken off the needles and stored away in bottles the next morning.

2nd. *Pearl Coating*.—Pills intended to be coated in this manner should not be made up with glycerine, this excipient being too hygroscopic. The pills should be as round as possible and moderately hard and dry; it is best to keep them exposed on trays for at least a day before the coating is proceeded with. Should the mass be crumbly the pills will hardly be in a condition for this coating. Another difficulty occurs with pills containing essential oils. Unless these are varnished previous to the coating the oil will work through and spoil the appearance. It is best to dilute the pill varnish in common use to half strength and to keep the pills for a day before covering them with chalk.

The author uses two covered gallipots and a round tin box in the process. The pots should be perfectly smooth, and have well-fitting lids, and should be large enough to hold double the quantity of pills for coating. The tin corresponds in size to the pots. Some French chalk is then placed in the tin and the pills in one of the pots, damped with a small quantity of a mixture of equal parts of mucilage of acacia, simple syrup and water. They are then turned out of the pot on to the tin containing the chalk, shapen sharply and emptied out on to the lid of a cardboard box and kept in motion so as to separate the loose chalk. After this they are ready for the second gallipot, which should be kept as polisher only. This is repeated several times, each time removing as much of the loose chalk as possible before using the polisher. Particular attention should be given to the washing of the pots between each course, and to keeping the polisher perfectly dry.

Process for the Rapid Preparation of Mercurial Ointment. M. Passérieux. (*Bull. de la Soc. de Pharm. de Bordeaux*, July, 1890; *Amer. Journ. Pharm.*, October, 1890.) The author proposes a method, which consists in placing a small quantity of lard in a mortar with the mercury and working it until the extinction of the metal, adding, at the same time, drop by drop, a small quantity of water charged with oxygen. Ten drops of this water are added for each 100 grams of mercury, this amount being quite sufficient.

to insure rapid work. The operation is terminated by adding the remainder of the lard.

Assay of Mercurial Ointment. C. Thein. (*Apotheker Zeitung*, 1891, 172.) A moderately wide test tube is filled to within one inch from the mouth with a neutral solution of 1 part of magnesium sulphate in 2 parts of water. 5 grams of the ointment are then placed in the test tube and the whole heated in a water-bath until the fat melts and forms a clear layer above the aqueous solution. After the fat becomes clear a small stick is suspended in the fat and the test tube set aside until the contents become cold; by gently warming the part of the test tube containing the fat the latter can be withdrawn from the test tube, and after the removal of the stick, weighed. By the appearance of the fat some idea of its nature may be obtained. The mercury, after pouring off the saline solution, is washed several times with water, dried by putting it in crumpled filtering paper, and weighed. If the mercury used was not pure the weight obtained will be deficient, as the contaminating metals will gradually unite with the fatty acids, and, hence, be found in the fat.

Unguentum Hydrargyri Nitratis. J. Lothian. (*Pharm. Journ.*, 3rd series, xxi. 872.) The combination suggested by the author for the preparation of this ointment consists of equal parts of white vaseline and lanoline in place of the lard. This makes an ointment of nice citron appearance and good consistence, and keeping very well. A larger proportion of lanoline makes it too sticky. The author's main contention is that the lard is the disturbing factor in the official ointment, a view which, however, does not meet with general acceptance.

In making this ointment much seems to depend on the *modus operandi*. It is an advantage, as recommended in the U. S. Pharmacopœia, to use one-half of the nitric acid to oxidise the fats before adding the mercury dissolved in the other half. Special care should be devoted to the temperature as upon this the colour of the ointment mainly depends. The author thinks that 212° F., as recommended in the B.P., is the best, and the ointment should be vigorously stirred until quite cold.

Lemon Juice. T. A. Ellwood. (*Pharm. Journ.*, 3rd series, xxi. 610.) The author arrives at the following conclusions:—

(1) The British Pharmacopœia maximum strength for lemon juice is higher than is warranted.

(2) The average of the Pharmacopœia is also high.

(3) The acidity varies regularly according to the progress of

time ; increasing from August to December and decreasing from December to August.

(4) Lemon juice and lemons, however carefully preserved, suffer a slight decrease in acidity.

(5) The amount of saccharine matter increases with age up to a certain point, when it remains permanent.

Morphine Salts and Cherry-Laurel Water. T. Salzer. (*Pharm. Zeitung*, 1890, 669.) The appearance of a precipitate in a freshly-made solution of morphine hydrochlorate in distilled cherry-laurel or bitter-almond water has been frequently noticed. This precipitation has been attributed to various causes, such as the decomposition of the solution by light, the glass vessels giving up alkali to the solution, the action of micro-organisms, and the use of magnesia in making the medicinal water. The author recently found the precipitation in one case at least to be due to the distilled bitter-almond water containing considerable quantities of ammonium cyanide, a constituent of the bitter-almond water first noticed by Linde. He found 10 c.c. of the water to contain sufficient of this *normal* constituent to precipitate 0.4 gram of morphine. The water used in making this bitter-almond water was free from ammonia.

NOTES AND FORMULÆ.

PART III.

NOTES AND FORMULÆ.

Influence of Light on a Powder Containing Iodoform and Calomel. G. Roe. (*Pharm. Journ.*, 3rd series, xxi. 846.) A mixture of equal parts of calomel, iodoform, and powdered starch was kept on a shelf exposed to strong light. After a few days brown spots appeared on the surface most exposed to light, which gradually assumed a scarlet colour; a portion kept in the dark had not changed; a solution of the iodoform in ether was neutral to litmus paper, and the calomel gave no evidence of impurities. Concluding some chemical reaction had taken place, the author tried the result of mixing iodoform with other salts. A portion of each was exposed to the light for seven days, and a similar quantity kept in the dark, with the following results:—

(1) Iodoform and calomel: change commenced after forty-eight hours.

(2) Iodoform and hydrarg. c. creta: change commenced after four days.

(3) Iodoform and hydrarg. perch.: no change after seven days.

(4) Iodoform calomel and boric acid: slight change after seven days.

(5) Iodoform and ung. hydrarg.: no change.

(6) Iodoform and lead acetate: no change.

(7) Iodoform and starch: no change.

Oleite, or Sulpho-Ricinoleate of Soda. W. A. H. Naylor. (*Chemist and Druggist*, August 2, 1890.) The author suggests the following as a good working formula for this compound:—

Take 1 lb. of castor oil, and add to it gradually, with continuous stirring, 2 oz. by weight of sulphuric acid (B.P.). This part of the process will occupy several hours, and should be timed so as to be finished towards the end of the working day. In the morning introduce in the same manner 1 oz. by weight of the acid, or a sufficiency. The point of finality is reached when the product

remains clear, or, as is generally the case, is only faintly opalescent when diluted with about forty times its volume of distilled water. The application of a suitable amount of heat is favourable to the reaction. The temperature of the mixed oil and acid may be allowed to reach 110°F. , and may, without detriment, even rise to 120°F. When chemical combination is complete, the product is at once intimately mixed with $1\frac{1}{2}$ times its weight of distilled water, and allowed to stand until separation into two distinct portions has ensued. The supernatant and oily layer is then removed and neutralized with a 10 per cent. aqueous solution of caustic soda. This soda compound is shaken up with five times its volume of proof spirit and set aside, when any free oil will rise to the surface. The lower and spirituous portion is evaporated on a water-bath to a thick jelly, the liquid being kept faintly alkaline by the addition of soda solution if necessary.

The resulting product usually contains a small proportion of sulphate of soda, but the quantity is insufficient to rank as a serious objection in view of the uses to which oleite is likely to be applied. If, however, in any case, it is deemed necessary to eliminate traces of alkaline sulphate, the sulpho-ricinoleate of soda must be treated with alcohol, in which the latter is soluble and the former practically insoluble.

Note on Solution of Albumen, B.P. R. A. Cripps. (*Pharm. Journ.*, 3rd series, xxi. 939.) The proneness of this solution to decomposition is a source of annoyance to the chemist, and practically entails the preparation of some fresh solution every time it is required as a test. The author has found that the presence of acetic acid effectually prevents this decomposition for several months. Some which was kept for six months showed no signs of change; 10 per cent. of the B.P. acid is sufficient.

Elixir of Liquorice. M. Dietel. (*Pharm. Zeit.*, 1891, 322.) 300 grams of extract of liquorice are dissolved in 900 grams of fennel water, and 50 grams of solution of ammonia added; the mixture is frequently agitated in a well-stopped bottle during several days and then a solution of 10 grams of oil of anise in 240 grams of alcohol is added. After standing the clear portion is decanted and the remainder filtered.

Perchloride of Mercury Pellets. C. J. Bond. (*Chemist and Druggist*, August 9, 1890.) The author calls attention in the *Lancet* to the advantages of a combination of equal parts of perchloride of mercury and chloride of sodium for the preparation of solutions for surgical and medicinal purposes. A pellet con-

taining $4\frac{1}{2}$ grains of the perchloride dissolves in a pint of warm water in about three minutes, forming a solution of 1 in 2,000. The advantages claimed for the combination are:—(1) That solutions of the perchloride and chloride of sodium with hard water containing lime do not turn milky or throw down a precipitate, as is often the case with solutions made with the double salt of ammonium chloride and mercury after standing a short time. (2) The solution is neutral and not acid, as in the case of the ammonium salt; moreover, chloride of sodium is a natural constituent of the blood serum and other fluids of the body. As these advantages apply also in the case of strong solutions of perchloride and the official liq. hyd. perchloridi, the author thinks it would be desirable that the pharmacopœial preparations should be made with chloride of sodium instead of chloride of ammonium.

Solution of Salicylate of Mercury. M. Vacher. (*Amer. Journ. Pharm.*, March, 1891, 129.) The author uses solutions of 1 to 1,000 grams of the salicylate of mercury, which he prepares in accordance with the following formula:—

Corrosive sublimate	1 gram.
Salicylate of soda	2 grams.
Distilled water	1,000 grams.

The sodium chloride formed in the process increases the solubility of the salicylate of mercury. The author employs this salt both internally and subcutaneously. For internal administration he gives 15 grams daily of the 1 to 1,000 solution. For subcutaneous injections he gives a 1 to 100 solution, prepared as above, so that 1 ccm. would represent 1 cgm. of salicylate of mercury. The injections do not cause pain or abscess.

Glutin-Peptide-Sublimate Hydrochloride. M. Paal. (*Apoth. Zeitung*, 1890, 621. From *Pharm. Journ.*) The first stage in the manufacture of this mercurial preparation consists in the suitable treatment of gluten with hydrochloric acid, resulting in the formation of what he calls "hydrochloride of gluten-peptide, containing about 12 per cent. of hydrochloric acid." This compound, which is soluble in water and in alcohol in all proportions, is described as combining with mercuric chloride to form "double salts," of which the one containing 50 per cent. of HgCl_2 is insoluble, and that containing the lower quantity is soluble in alcohol; both are, however, soluble in water. For therapeutic purposes a compound containing exactly 25 per cent. of HgCl_2 was prepared as a white hygroscopic powder, consisting of shining

scales. An aqueous solution of this compound is said not to be precipitated by caustic or carbonated alkalies, nor by blood or albumen solution, while in the dry condition or in solution it can be kept in closed vessels, sheltered from light, for a year without alteration. Further, the caustic properties of the mercuric chloride are said to entirely disappear in the combination with the peptone. The advantage claimed for this preparation over others consists in its prompt and certain action, and the small pain and irritation caused when used as an injection.

Easton's Elixir. F. Edel. (*Chemist and Druggist*, August 23, 1890.) The following formula is offered as an improvement on that of the United States National Formulary:—

Quinine sulphate	128 grains.
Ferric phosphate (U.S.P., 1890)	256 „
Strychnine sulphate	1½ „
Rectified spirit	2 ozs.
Glycerine	2 „
Simple syrup	2 „
Distilled water	1 „
Aromatic elixir, q.s.	

Dissolve the strychnine in the spirit; then add the quinine. Mix the glycerine and syrup, and heat; when hot add to the solution of alkaloids. Continue heating gradually, until the quinine is dissolved; then add enough elixir to make 15 oz. Dissolve the iron in the water by aid of heat, and add to the solution of alkaloids; shake thoroughly, allow to stand for three or four hours, and filter.

Syrup of Raspberries. E. Dieterich. (*Chemist and Druggist*, August 30, 1890.) The author recommends the following:—Bruise 1,000 parts of raspberries, allow the pulp to stand during two days at the ordinary temperature, and then express the liquid portion. Add to this 20 parts of powdered sugar, and when it is dissolved fill the juice into narrow-necked bottles so as to reach up to the neck; put parchment-paper over their mouths, and allow to ferment at indoor temperature until no more carbonic acid gas is given off, or until a sample of the juice is no longer rendered turbid when mixed with half its volume of alcohol; then filter. Next heat 500 parts of sugar in 330 parts of distilled water, so as to obtain a product of 580 parts; add 7½ parts of citric acid, and afterwards 450 parts of the filtered juice. Raise once to boiling, skim carefully, and strain through flannel.

Blaud's Pills. (*Chemist and Druggist*, August 23, 1890, from *Pharm. Zeitung*.) The following formula is stated to give a plastic and beautifully green mass, ʒiix. of which make 100 pil. *Blaudi majores*, while ʒvi. yield 100 pil. *Blaudi minores* :—

Sulphate of iron in fine powder	60 drachms.
Bicarbonate of soda	30 "
Carbonate of potash	30 "
White sugar	20 "
Glycerine	8 "
Water	about 30 "

Take all these ingredients by weight, mix them in a tared iron basin, and place on a water-bath. Stir constantly, and when the carbonic acid gas begins to come off add 3 ozs. of rectified spirit, and stir well until all the gas has come off and the mass is of a soft consistency. Then note its weight, and make up to 150 drachms with a mixture of powdered gum arabic 1 part, and powdered althea 2 parts. Beat into a mass in an iron mortar, adding, if necessary, a sufficiency of a mixture of 1 part of glycerine, and 2 parts of water to make a proper mass.

Tinctura Ferri Formatis. M. Rozsnyai. (*Pharm. Post*, 1891, 402; *Amer. Journ. Pharm.*, July, 1891.) The following two formulæ are given :—

(1) 150 grams of ferric chloride solution are diluted with 600 grams of distilled water, and besides this, 100 grams of ammonia are diluted with 600 grams of distilled water. These solutions, cooled by surrounding ice, are allowed to run in a thin stream into a vessel containing three liters of boiled distilled water; the precipitate is washed by decantation until free from chlorides, then collected on a filter, allowed to drain, expressed, transferred to a vessel containing 100 grams of formic acid (sp. gr. 1.18) and dissolved by stirring. The solution is diluted with distilled water to 500 grams, and 500 grams of alcohol added; after standing, the clear liquid is decanted; this contains 3 per cent. of ferric formate. If this preparation be made at an ordinary temperature the ferric hydrate does not dissolve completely, and the finished preparation has a tendency to precipitate a basic salt.

(2) 75 grams of formic acid (sp. gr. 1.18) are neutralized with 35 grams of precipitated calcium carbonate, the calcium formate being held in solution by warming to 30°C. ; 140 grams of ferric sulphate solution are mixed with 300 grams of distilled water and 25 grams of formic acid. Add to this solution that of the calcium

formate, stirring constantly, and, lastly, 500 grams of alcohol; allow to stand 5-6 hours, filter and wash the precipitate with dilute alcohol until the filtrate measures one liter. This tincture also contains 3 per cent. of ferric formate.

Tinctura Hæmostyptica. H. Fritsch. (*Therap. Monatsh.* From *Chemist and Druggist.*)

Powdered ergot	10 parts.
Rectified spirit	20 "
Sulphuric acid	2 "
Boiling water	500 "

Infuse the ergot in the acid and water for two hours, evaporate to 182 parts, add the spirit, and 30 parts of syrup of cinnamon. The dose of this is an ounce three times a day.

Ferrated Cod-Liver Oil. (*Amer. Journ. Pharm.*, April, 1891.) 1·0 gram of medicinal soap is dissolved in 60·0 grams of warm distilled water and 17·0 grams of solution of oxychloride of iron diluted with 30·0 grams of distilled water added; the precipitate is washed first by decantation, later on a filter, until the washings cease to react with silver nitrate. The precipitate, dried as much as possible by pressing between filter paper, is warmed with 100·0 grams of cod-liver oil on a water-bath until dissolved, and the solution filtered after cooling. The preparation is a clear, dark brown oil which contains about 0·5 per cent. of metallic iron.

Solution of Malate of Iron. G. M. Beringer. (*Amer. Journ. Pharm.*, June, 1891.) Take of

Cranberry juice	14 fl. ozs.
Iron in the form of fine wire and perfectly clean (card teeth)	1 oz.
Alcohol	2 fl. ozs.

The iron is added to the cranberry juice contained in a suitable vessel and set aside in a warm place for several days, being occasionally agitated. It is then boiled for half an hour to one hour, adding water from time to time to replace the amount evaporated. Filter and wash the filter with sufficient water to yield 14 fluid ounces of filtrate, add the alcohol and again filter if necessary. This yields a reddish liquid of a slightly acid, and not unpleasant, ferruginous taste.

Pilula Ferri Protochloridi. J. B. McLaren. (*Pharm. Journ.*, 3rd series, xxi. 553.) The author suggests that these pills should be made with some absorbent powder, such as liquorice or althæa,

and beat into a mass with a small quantity of some inert extract. The following formula, he finds, does very well :—

Anhydrous protochloride of iron . . .	3 grains.
Powdered liquorice	1 grain.
Extract of liquorice	1 "

Mix to make one pill.

The only objection to this method is the size of the pill, but this is counterbalanced by its better keeping properties.

The Uses of Keratin. H. Unna and M. Beirsdorff. (*Lancet*, October 18, 1890.) The authors recommend that drugs which irritate the gastric mucuous membrane, such as digitalis, squill, salicylic acid, iodide of iron, etc., be given in the form of pills coated with keratin, or in capsules of the same substance. Drugs which diminish the activity or which neutralize the acidity of the stomach, such as tannic acid, nitrate of silver, and alkalies, should be given in the same way. A coating of keratin is also desirable when prescribing drugs that are required to act on the intestinal mucous membrane alone, and is especially valuable in the use of drugs which are given for the purpose of destroying intestinal worms, but which, if introduced into the stomach in the ordinary way, are absorbed to such an extent as to cause toxic symptoms, or to reduce their germicidal activity. Keratin is obtained by treating shavings of horn with ether, alcohol and an acid. It possesses the peculiar property of being insoluble in the stomach, but freely soluble in the intestines.

Ichthyol Preparations. H. Unna. (*Amer. Journ. Pharm.*, March, 1891.) The author gives the following formulæ the products of which can be removed by washing with water.

1. Ichthyol	40 parts.
Starch	40 "
Cold water	20 "
Saturated albumen solution . . .	1-1.5 "

The starch is moistened with the water, the ichthyol carefully incorporated, and lastly the albumen solution added. The last addition is made to prevent the deposition of the starch.

2. Ichthyol	25 parts.
Carbolic acid	2.5 "
Starch	50 "
Water	22.5 "

The first two ingredients are dissolved in the water with the aid of a gentle heat, allowed to cool and the starch incorporated.

Preparation of Hypnal. M. Demandre. (*Amer. Journ. Pharm.* From *Bull. de la Société des Pharm.*, No. 9, 1891.) Pharmacists may easily prepare this compound for their own use in the following manner:—Make a solution of 47 grams of chloral in 50 grams of distilled water; also prepare a solution of 53 grams of antipyrine in the same quantity of distilled water; mix these solutions and place the liquor in a funnel provided with a stop-cock. An oily liquid falls from the aqueous mass; this portion is drawn into one capsule and the water into another. In about 24 hours the oily liquid is found to have become almost wholly transformed into a mass of transparent rhombic crystals. A few smaller crystals are formed in the centre of the aqueous liquor. The mother liquors are now drained off from both crystalline formations and the crystals mixed together. The latter are then dried between sheets of filtering paper, or under a bell-glass in the presence of sulphuric acid.

Salicyl-Bromanilid. (*Amer. Journ. Pharm.* From *Pharm. Zeit.*, 1891, 323.) Salicyl-bromanilid is a combination introduced by Radlauer which is said to contain bromacetanilid, bromine and salicylic acid. It is a white powder with an unpleasant, somewhat acidulous taste, sparingly soluble in cold water, easily soluble in boiling water, alcohol and ether. The dose varies from 0.2 to 0.6 gram; it is used as an antinervine and reliable antipyretic.

Euphorin. (*Pharm. Journ.*, 3rd series, xxi. 818.) Euphorin is not the name of a new substance but merely a new name for one which is already well-known, viz., phenyl-urethane. In doses of 6 to 8 grains it has been employed as an antipyretic, anti-rheumatic, and analgesic.

Antifebrin, Phenacetin and Exalgin in Neuralgia. T. P. Thomson. (*Chemist and Druggist*, September 13, 1890.) The author states that antifebrin is a much more effectual pain reliever than antipyrine. Three or four grains in a little brandy or whisky, and then a little water added to this mixture, is the best way of giving it. The dose is repeated in four hours if necessary. The author has never witnessed any bad, depressing effect from the employment of antifebrin. In neuralgia of the head it gives sure and speedy relief. In any case of nerve pain where one might suspect a weak or fatty heart phenacetin appears preferable to antifebrin, though it does not seem to act quite so surely as the latter. Phenacetin in 7 or 8 grain doses every four

hours is a safe and effectual remedy in all neuralgias, in the head, back, or any other part of the body. The author has also found exalgin useful, and quite corroborates Professor Fraser's statement regarding the efficacy of this preparation.

Apyonin. A. Petit. (*Chemist and Druggist*, June 1, 1891.) Apyonin is the name of a substance of the methyl violet class which has been introduced as an antiseptic similar to Merck's pyoktanin. It is a yellow, crystalline powder, slightly soluble in cold and hot water, soluble in alcohol, and difficultly soluble in ether. When heated it sublimes, charring at a higher temperature, and burning without ash. The water solution is neutral, and gives a precipitate with caustic potash, which is soluble in alcohol. The plain solution produces colours on the addition of hydrochloric acid or peroxide of hydrogen solution.

Pilocarpine as an Antidote in Belladonna-Poisoning. W. McGowan. (*Chemist and Druggist*, August 23, 1890. From the *Lancet*.) The author has had occasion to try this antidote in a case of poisoning with belladonna, and reports very favourably on its action.

Fatal Effects of Oleo-Resin of Male Fern. (From *American Journal of Pharmacy*.) The *Wiener klin. Wochenschr.* reports the case of a child 5½ years old, to whom two drachms of the oleo-resin were given in three doses within one hundred minutes. In an hour and a half part of the tapeworm was expelled, then vomiting occurred, and somnolence, followed by twitching, and trismus, and ending in death five hours after the last dose of the extract.

Valerianates of Antipyrine and Quinine as Remedial Agents. M. Sochaczewski. (*L'Union Pharm.*, Nov. 15, 1890, 540.) Valerianate of antipyrine is stated by the author to be more active than antipyrine, and is described as occurring in white, very regular cubic crystals, very soluble in water, and as having a strong valerian odour and a slightly disagreeable taste. The double valerianate of antipyrine and quinine is reported to be very active in neuralgia. It occurs in long, white, transparent prismatic crystals, very soluble in water and in alcohol, and resembling in taste and odour valerianate of quinine.

Antikamnia. F. W. Haussmann. (*Amer. Journ. Pharm.*, April, 1891.) Also F. Goldmann. (*Pharm. Zeit.*, 1891, 255.) This new antipyretic, which is stated to be an amido-derivative of benzol, and offered as a valuable remedy for headache, rheumatism

and neuralgic pains has been analysed by F. W. Haussmann who finds it to have the following composition:—

Antifebrin (acetanilid)	. . .	47 parts.
Bicarbonate of sodium	. . .	50 "
Tartaric acid	. . .	8 "

F. Goldmann, who has obtained somewhat different results, gives the composition as follows:—

Antifebrin	. . .	67.4 parts.
Bicarbonate of sodium.	. . .	22.2 "
Caffeine	. . .	9.8 "

Antiseptol, or Iodo-Sulphate of Cinchonine. P. Yvon. (*Nour. Rem. From Amer. Journ. Pharm.*, October, 1890.) The author makes this preparation, for therapeutic use, as follows:—The sulphate of cinchonine is dissolved in water, using 25 grams of the salt to 2,000 grams of water, and precipitated by means of an iodated solution of iodide of potassium prepared after the following formula: Iodine, 10 grams, iodide of potassium, 10 grams, water, 1,000 grams. The reagent should not be used in excess. The liquor should always be allowed to retain a little of the sulphate of cinchonine. The precipitate is placed on a filter, and washed with water until the latter no longer contains iodine, after which it is dried in the open air. The iodosulphate of cinchonine is a well-defined product, which contains 50 per cent. of iodine. It may be obtained crystallized, but for medical uses it is best made in accordance with the formula described.

Iodoformed Guaiacol. M. Picot. (*Amer. Journ. Pharm.*, June, 1891.) The preparation used by the author in his new treatment of tuberculosis by hypodermic injections is formulated as follows in a communication (March 3, 1891) to the *Académie de Médecine*. The basis of the liquid is sterilized olive oil and vaseline; each cubic centimetre of this excipient should contain 1 cgm. of iodoform and 5 cgm. of guaiacol. The same mixture is used in cases of pleurisy.

Resorcin Spray in Whooping-Cough. J. W. Farlow. (*Boston Med. and Surg. Journ.*) The author uses a 2 per cent. solution of resorcin in water which is sprayed into the nose, pharynx and larynx every two hours. The solution is inodorous, nearly tasteless, non-irritating, and not poisonous, and gives speedy relief.

Essence of Pepsin. G. M. Beringer. (*Amer. Journ. Pharm.*, June, 1891.) A product very similar in appearance and chemical

composition to the various proprietary preparations sold under this title can be made by the following process:—

Take of

Fresh calves' rennet	4 troy ounces.
Glycerine	4 fluid ounces.
Alcohol	2 " "
Tincture of fresh orange peel . .	2 " drachms.
Water	14 " ounces.
Purified talc	1 troy ounce.

Mix the rennet and glycerine, then add the alcohol, water and tincture of orange, and macerate for four or five days, with repeated agitation. Add the talc, agitate and allow to stand for an hour, or until the talc has been largely deposited. Now decant on a muslin or flannel filter, and afterwards filter through paper.

One fluid drachm of the essence with four fluid ounces of water acidulated with hydrochloric acid will easily digest 300 grs. of egg albumen in four hours at 104° F., and one fluid drachm will curd one quart of milk at 100° F. in 4 minutes.

Beef Tea. M. Spanton. (*Chemist and Druggist*, November 29, 1890.) The following directions give an excellent result. Macerate 1 lb. of round of beef, well minced, with 1 pint of cold water for 4 hours; then transfer both to an earthenware vessel lightly covered over, and place this inside another vessel, or pan, filled with water, which, after being heated to the boiling-point should be allowed to simmer gently from four to six hours. The product can be thickened if desired with arrowroot, sago, or rice.

Sterilization of Drinking Water. (*Apoth. Zeit.*, 1890, 485; *Amer. Journ. Pharm.*, October, 1890.) Various chemicals have been proposed for this purpose, of which ferric chloride, alum, tannin and potassium permanganate have been used, but it was found that these to be effective had to be employed in quantities imparting an unpleasant taste to the water. Recently H. Tromp proposed hydrogen peroxide as the ideal substance to sterilize water, as it imparts neither odour nor taste, and is harmless and efficient; one part is added to 3,000-10,000 parts of water. Dr. Altchoefer confirms the efficiency of hydrogen peroxide, but asserts that 1 : 1,000 must be used; after 24 hours standing the water microbes as well as pathogenic microbes (cholera, typhus) will be destroyed. In using hydrogen peroxide 10 c.c. of a 10 per cent. solution is added to a liter of water.

Injurious Effects of Sulphurous Acid present in Wines. L. Pfeiffer. (*Medical Chronicle*, October, 1890.) In a paper on

"The poisonous action of sulphurous acid and its salts," the author points out that sulphites are sometimes added to wine in such quantity as to be capable of producing injurious results. Out of 80 specimens of wines examined by Kämmerer, 16 contained sulphites ranging from '0017 to '0093 per cent. List detected sulphites in a large number of French wines, the amount varying from '0009 to '0135 per cent. The author considers their presence in wine as likely to cause irritation of the digestive organs if the quantity of sulphurous acid (SO_2) is greater than 0.08 gram per litre.

Trichloroacetic Acid as a Caustic. A. H. Ehrmann. (From *Pharm. Journ.*) Trichloroacetic acid (CCl_3COOH) has been found by the author very useful as a local caustic in diseases of the nose and throat, presenting the advantage over chromic acid that its action remains localized and is more persistent. The acid is sent out in colourless rhombohedric crystals, having a slightly pungent odour, melting at 52° and boiling at 195°C ., readily soluble in water and alcohol, and deliquescent in air.

Powder for Migraine. (*Amer. Journ. Pharm.*, July, 1891.) The following is recommended:—

Caffeine citrate	10 grams.
Phenacetin	12 "
Sugar of milk	25 "

This is for one dose. If necessary the dose may be repeated after two hours.

Toothache Drops. (*Chemist and Druggist*, August 30, 1890.)

Chloroform	1 oz.
Oil of cloves	2 drachms.
" peppermint	$\frac{1}{2}$ drachm.
" spearmint	2 drops.
" sandalwood	15 "
" cajeput	4 "
Tincture of cassia	$1\frac{1}{2}$ oz.

Mix these, and add 1 oz. of a tincture containing 20 grains of catechu to 1 oz. of absolute alcohol.

Tooth Soap. (*Chemist and Druggist*, February 28, 1891.) Heat together on a water-bath 15 lbs. of cocoa-nut oil and 5 lbs. of olive oil, and when melted add 5 oz. of Berlin red, 5 ozs. of calamus, $2\frac{1}{2}$ oz. of cloves, 1 lb. of sugar, 5 oz. of precipitated chalk, and 1 lb. of orris-root (all in fine powder). Heat the mixture to

about 82° F., then add 10 lbs. of soda ley (38° Baumé) at the same temperature. When saponification is complete add the following oils:—

Oil of peppermint	4 oz.
„ star-anise	1 „
„ cloves	2 „
„ cassia	3 drachms.

Mix these with the soap while the latter is in a pasty state, and set aside for a day or two to allow it to set, then cut up the mass into suitable-sized blocks.

Remedies for Corns. H. M. Whelpley. (*Chemist and Druggist*, August 16, 1890.) The author states that probably the action of the most popular corn-cures depends on salicylic acid. Among the many therapeutic properties of this comparatively new remedy is its power to disintegrate epithelial tissue. The preparation he has found most useful consists of 9 parts of salicylic acid, 1 part of extract of cannabis indica and 48 parts of collodion. This is applied to the corn every night with a camel-hair brush.

A salicylic-acid corn plaster is made by melting 6 parts of resin, and adding 5 parts of Canada balsam, and then stirring in 10 parts of salicylic acid as it cools. This can be spread on any suitable medium for a plaster.

Lanolin forms the basis of another salicylic acid plaster, and cocaine is added with the idea of making it painless. To prepare this plaster, mix 6 drachms of salicylic acid thoroughly with 10 drachms of lanolin. Dissolve 5 grains of hydrochlorate of cocaine in a small quantity of warm alcohol, and mix the solution with 1 fl. oz. of creosote. Mix half an ounce of melted white wax with half an ounce of vaseline, and add the creosote solution. To this add the cocaine solution, and mix.

Salicylic acid is sometimes associated with arsenic, in the proportion of 2 drachms of the former and 1 drachm of arsenious acid and 1 oz. of vaseline. This is used as a salve on linen. Still another corn-plaster is made of salicylic acid 1 part, Burgundy pitch 1 part, and yellow wax 1 part.

A caustic corn-salve is made by mixing a hot saturated solution of caustic soda or potash with twice its bulk of glycerite of starch. A solution used for the cure of corns is obtained by dissolving 30 grains of tannic acid in 1 oz. of a mixture of equal parts of tincture of iodine, acetic acid, and glycerine.

Mercurial Collodion as a Remedy for Warts. M. Kaposi. (*Amer. Journ. Pharm.*, August, 1890.) This collodion is prepared

by dissolving 1 part of mercuric chloride in 30 parts of flexible collodion. It is applied with a brush once daily to the wart and around its base.

Treatment of Persistent Dandruff. E. Blake. (*Lancet*, December 27, 1890.) Dr. Shuldham's treatment is as follows:—The head should be first well washed with hot water and alcohol soap, consisting of 2 ounces of pure soft soap, half an ounce of rectified spirit of wine, and 10 minims of oil of lavender. The soap is afterwards washed away with plenty of hot water, and the head then thoroughly dried by means of a warm soft cloth. A glycerole of tannin, containing from 10 to 30 grains to the ounce, is then freely and firmly rubbed into the scalp. Should tannin fail, which is rarely the case, resorcin may be tried. This process should be repeated once, twice, or thrice a week, as required. After the removal of the dandruff, a daily dressing with carbolic oil favours the growth of fresh hair: 10 grains of absolute phenol, 1 drachm of oil of cinnamon, and 1 ounce of olive oil. Warm together and decant off. Apply freely every day.

Salicylic Acid Lotion for Dandruff. E. Dieterich. (*Pharm. Centralhalle*, 1891, 147.)

Salicylic acid	25 grams.
Glycerine	50 „
Dilute alcohol (68 per cent.)	925 „
Oil of gaultheria	5 drops.
Oil of rose	1 drop.
Oil of orange-flowers	1 „

Dissolve and filter.

The lotion is used as follows: Cleanse the scalp with soap and warm water, rinse with warm water, and dry with a towel. Put two tablespoonfuls of the lotion in a wine glass, fill with warm water and apply with a sponge; after removing excess of liquid, cover the scalp for half an hour with a cloth.

Preparations for Chilblains. (*Amer. Journ. Pharm.*, November, 1890.) The *Journ. de Méd.* for October, 1890, gives the following:—

Bathe the extremities in a decoction of oak leaves and wipe dry. Apply camphorated alcohol with friction. Powder the surfaces with a mixture of 10 grams of salicylate of bismuth and 90 grams of starch. To lessen the nocturnal itching apply the following:—Glycerine and rose-water, of each 50 grams.; tannic acid, 10 centigrams. Then powder the parts, as before, with the bismuth and

starch mixture. In case ulcerations are present they should be dressed with oak leaves softened by soaking in water.

Embrocation for Chapped Hands. P. Vigier. (*Journ. de Méd.*, October, 1890.) The author recommends the following formula:—

Tannic acid	50 centigrams.
Neutral glycerine of 80° B.	20 grams.
Rose water	200 „

The above journal adds the following formulæ for the same purpose:—

1. Lanolin 50 grams.
Vanillin 10 centigrams.
Essence of rose 1 drop.
2. Lanolin 100 grams.
Paraffin 25 grams.
Vanillin 10 centigrams.
Essence of rose 1 drop.

Cachous. (*Chemist and Druggist*, December 27, 1890.)

Extract of liquorice	400 grains.
Powdered catechu	120 „
Powdered gum arabic	60 „
Boiling water	1 oz.

Digest the extract of liquorice in the water, stirring until smooth, then add the catechu and gum arabic, mix, evaporate to a pilular consistence, and add:—

Powdered cascarilla	8 grains.
„ charcoal	8 „
„ orris root	8 „
„ mastic	8 „
Oil of peppermint	8 drops.
Tincture of ambergris	4 „
„ of musk	4 „

Divide the mass into 1-grain pills and silver or coat with sugar.

Menthol Dentifrice Water. (*Chemist and Druggist*, May 30, 1891.)

	Parts.
Star-anise	100
Cochineal	10
Red cinchona bark	10
Canella bark	10
Cloves	10
Pellitory root	10
Spirit	5000

Macerate for a week, and add to the liquor 15 parts of menthol; then filter.

Dentists' Moulding Wax. P. David. (*Journ de Pharm. et de Chim.*, and *Chemist and Druggist*.)

	Parts.
Stearin	25
Half-soft copal	25
Talc	50
Carmine	0.5
Oil of rose geranium	2 drops to the ounce.

Melt the resin by the heat of a sand-bath, and when slightly cooled add the stearin, stirring constantly. When this has melted add the other ingredients, previously intimately mixed, and stir so that a homogeneous product may be obtained.

The adhesiveness of the composition may be increased or diminished by modification of the amount of copal. A more thorough blending of the colour may be insured by dissolving the carmine in a little potash solution before mixing with the chalk.

Antiseptic Mouth Wash. (*Monatshefte*, February, 1890.) The following is recommended:—

Saccharin	1.0 gram.
Sodium bicarbonate	0.5 "
Alcohol	100 grams.
Oil of peppermint	2 drops.

For use add a teaspoonful to a small glassful of water.

Mouth Wash for Preventing Dental Caries. (*Chemist and Druggist*, May 9, 1891.)

Tannin	75 grains.
Tincture of iodine	40 minims.
Tincture of myrrh	40 "
Iodide of potassium	15 grains.
Rose water to	6 oz.
Mix.	

A teaspoonful, diluted with half a glass of water, to be used for rinsing the mouth every morning.

Aristol Plasters. M. Cavaillès. (*L'Union Pharm.*, July, 1890.) The author prepares these plasters by mixing finely powdered aristol with a small quantity of oil, and adding to a liquified mixture of lanolin and caoutchouc plaster, previously cooled and rendered more fluid by the addition of benzol. The benzol is evaporated to a sufficient degree to leave a preparation suitable for spreading upon muslin. The plasters are said to

possess the full antiseptic properties of aristol applied in other ways. The author prepares plasters of iodol, iodoform, salol, and chrysarobin in the same manner.

Ceratum Salicylatum. M. Scheerer. (*Oester. Zeitschr. für Pharm.*, 1890, 631.) 2·0 parts of powdered salicylic acid are triturated with 5·0 parts of expressed oil of almonds, and added to a melted cerate consisting of 62·0 parts of expressed oil of almonds and 31·0 parts of yellow wax; heat is applied until the salicylic acid dissolves, then the cerate is allowed to cool somewhat and incorporated with 0·5 parts each of the oils of lemon and bergamot and poured into proper moulds.

Salicylic-Acid Shampoo. E. Dieterich. From (*Pharm. Centralhalle*).

Salicylic acid	25 grams.
Glycerine	50 "
Alcohol of 68 per cent.	950 "
Oil of wintergreen	5 drops.
Oil of rose	1 drop.
Oil of neroli	1 "

Mix and filter. Directions: Wash the head well with warm soapsuds, then with pure warm water, and dry it with a towel. Then pour two tablespoonfuls of the shampoo into a wineglass, fill this with warm water, and apply the mixture thoroughly, by means of a small sponge, to the scalp and hair.

Sulphite of Zinc for Antiseptic Dressings. C. R. C. Tichborne. (*Brit. Med. Journ.*, November 8, 1890, 1064.) Sulphite of zinc has been found very valuable as a material for the preparation of antiseptic dressings, and combines with its antiseptic powers the advantage of being non-poisonous and non-irritative. It can be used for the saturation of any fabric, such as gauze or lint, without the intervention of an adhesive material. The fabric is first boiled with water, to cleanse and sterilize it, after which a boiling solution of zinc sulphate and sodium sulphite in equivalent proportions is poured upon it, and when thoroughly mixed and saturated, the whole is allowed to stand for twelve hours. The zinc sulphite is said to be deposited in and about the fibres of the fabric in microscopic crystals, soft and even unctuous to the touch. The fabric is then passed under rollers submerged in water to remove traces of sodium sulphate. It is suggested that this kind of dressing might be dyed with an organic pigment to distinguish it from others, and for the purpose of indicating the progress of the discharges by the action of liberated sulphurous acid on the colour.

Mentholated Cream. (*Bull. Pharm., and Chem. and Drugg.*) The mentholated cream frequently used by barbers as a cooling application to the face after shaving may be prepared at follows:—

Gum tragacanth	1 drachm.
Glycerine	3 drachms.
Spirit	$\frac{1}{2}$ oz.
Menthol	40 grains.
Water	q.s.

Dissolve the tragacanth in 12 oz. of warm water, and add the glycerine and menthol dissolved in the alcohol. Colour pink with tincture of cudbear.

Menthol-Glycerine-Cream. (*Pharm. Centralhalle*, 1890, 384.) This preparation, intended for cleaning the teeth, is prepared as follows:—

Precipitated calcium carbonate	20 parts.
Powdered medicinal soap	10 "
Magnesium carbonate	5 "

Mix with sufficient glycerine to form a soft mass, colouring with carmine and flavouring with menthol.

Fluid Glycerine Soap. (*Pharm. Zeit.*, 1890, 386.) 500 grams of olein, 100 grams of alcohol and 280 grams of potash lye ($33\frac{1}{3}$ per cent.) are placed in a flask and agitated frequently while warmed in a steam-bath for half an hour, a solution of 50 grams of potassium carbonate in 100 grams of water is then added and the heating continued until a portion removed is perfectly soluble in water. The soap is next dissolved, with heat, in 1570 grams of glycerine, set aside for a few days in a cool place and filtered; the filtrate can be perfumed as desired.

Glycerinum Saponatum. Prof. Hebra. *Pharm. Zeit.*, July 19, 1890, 449. From *Pharm. Journ.*) This preparation, which is used as a basis for the topical application of various remedies to the skin, consists essentially of a neutral soda soap made by mixing intimately with cocoa-nut oil or melted tallow a quantity of caustic soda solution, sp. gr. 1.349, and absolutely free from carbonate, exactly sufficient to neutralize the fatty acids, then letting the mixture stand in a covered vessel twenty-four hours. Saponification takes place as the result of the spontaneously developed heat, and if care has been taken to ascertain previously the exact quantity of alkali required to neutralize the acid in the fat used, the product is a neutral soap, free from caustic or carbonated alkali, but containing mixed with it the liberated glycerine

and the water from the soda solution. This is cut into thin shavings and dried at a temperature of 80° to 100° C., after which the shavings are heated on a water-bath with chemically pure glycerine until dissolved and the solution filtered while hot. Upon cooling the glycerinum saponatum is obtained as a faintly yellowish more or less elastic mass, which is perfectly odourless and melts at the body temperature. It is claimed to be, as it stands, a very pleasant preparation for the hands, besides being a valuable ointment basis, since it is freely soluble in water and readily takes up other substances.

Cold Cream from Cotton-Seed Oil. W. L. Cliffe. (*Chemist and Druggist*, August 23, 1890.)

Cotton-seed oil	. . . . .	15 oz.
Spermaceti	. . . . .	3½ "
White wax	. . . . .	3½ "
Oil of lavender	. . . . .	12 drops.
Rose water	. . . . .	7 oz.

Glycerine Suppositories. M. Balland. (*L'Union Pharm.*, September 15, 1890.) A very satisfactory preparation is stated to be obtained in accordance with the following formula:—

Lanolin	. . . . .	2 grams.
Glycerine.	. . . . .	2 "
Cacao butter	. . . . .	1 gram.
White wax	. . . . .	1 "

The lanolin is first melted with the wax and the cacao butter. Then the glycerine is added and the mass is poured into moulds. The moulds should be placed in a mixture of ice and salt to prevent a separation of the glycerine. The suppositories are divided so as to weigh 6 grams each, which is heavier than ordinary suppositories, though the bulk is not much greater.

Ointment and Suppositories of Chrysarobin. M. Kosobudski. (*Russk. Medits.* From *Amer. Journ. Pharm.*, August, 1890.) Unguentum chrysarobini, for use in piles, is directed by the author to be made in the following manner:—

Chrysarobin	. . . . .	0.5 gram.
Iodoform	. . . . .	0.2 "
Extr. belladonnæ	. . . . .	0.1 "
Petrolatum	. . . . .	15 grams.

Apply three or four times daily.

Suppositoria chrysarobini, for internal piles, are prepared as follows:—

Chrysarobin	0.6 gram.
Iodoform	0.2 „
Extr. bellad	0.1 „

Cacao butter sufficient for ten suppositories.

Absorption of Drugs from Ointments. A. P. Luff. (*London Medical Recorder*, July, 1890.) The results of the author's experiments lead to the following conclusions:—If an ointment is employed for its local effect only, absorption of its active ingredient not being desired, lanolin will be found to be the best excipient for such an ointment.

Modern Dermatological Remedies. (*Pharm. Journ.*, 3rd series, xxi. 1040.) The following information respecting some of the newer forms of external remedies used in the clinic of Professor Hebra, Vienna, is published in the *Pharmaceutische Post*:—

Spray Treatment.—Very frequently an ether spray is used as a vehicle for mercuric sublimate (1 to 2 per cent.) and chrysarobin (10 per cent.). It is considered that the spray, besides its anodyne properties presents the advantage of attacking affected parts otherwise difficult to reach, such as those covered with hair. Whilst the mercuric chloride spray does good service principally in affections of the mucous membrane the chrysarobin spray is used in mycosis of the skin. The apparatus used is one combined with a ball blower.

Medicated Soaps.—The super-fatted medicated soaps introduced by Unna, are used in the manner recommended by Eichhoff. The basis consists preferably of beef tallow, together with liquor sodæ two parts, liquor potassæ one part and some olive oil. The super-fatted soaps employed are the resorcin-salicylic, resorcin-salicylic-sulphur, and the resorcin-salicylic-sulphur-tar soaps. In these combinations the resorcin is claimed to develop advantageously its action antagonistic to inflammation; the salicylic acid is said to dissolve the horny layer of the epidermis and to act as a bactericide; the sulphur also lowers the inflammation; while the tar diminishes the itching and favourably influences the dilated vessels.

Glycerinum Saponatum.—This is an ointment basis, containing a large proportion of glycerine, in the preparation of which a small quantity of a neutral cocoa-nut oil soda soap is used (see p. 284). Its composition varies from 80 to 92 per cent. of glycerine and 20 to 8 per cent. of soap. The *glycerinum saponatum* is

soluble in cold and warm water, and is said to possess the advantageous property of dissolving a large number of substances, and of holding other insoluble pulverulent substances in suspension. To this class belong:—

A. Ointments with an Acid Basis.—(1) Glycerinum saponatum with salicylic acid (5 p.c.), employed especially for the removal of horny epidermal growths; (2) Glycerinum saponatum with salicylic acid (5 p.c.) and resorcin (5 p.c.), combines the properties of the preceding with those of resorcin, in diminishing the inflammation, acting as an antiseptic and promoting the regeneration of the epidermis; (3) Glycerinum saponatum with salicylic acid (5 p.c.) and creasote (5 p.c.), promotes healing without pain in lupus vulgaris, lepra, etc.; (4) glycerinum saponatum with salicylic acid (3 p.c.) and tar (10 p.c.), useful in scaly eczema with itching.

B. Ointments with a Neutral Basis.—Glycerinum saponatum with zinc oxide (5 p.c.), used for cosmetic purposes and in slight cases of eczema; (2) Glycerinum saponatum with sulphur (10 p.c.); (3) Glycerinum saponatum with zinc oxide (10 p.c.), used in acne; (4) Glycerinum saponatum with iodoform (5, 10, to 50 p.c.), said to be remarkably active, purifying and promoting granular action in wounds, ulcers, buboes, and carbuncles. (5) Glycerinum saponatum with chrysarobin (10 p.c.), approved especially in psoriasis; (6) Glycerinum saponatum with hydroxylamine (1 p.c.), used in psoriasis of the face and hairy scalp; (7) Glycerinum saponatum with ichthyol (5 p.c.) renders good service in violent itching of skin affections and arthritic swelling of the joints; (8) Glycerinum saponatum with ichthyol (10 p.c.) and zinc oxide (10 p.c.), as in the preceding and in incipient eczema; (9) Glycerinum saponatum with carbolic acids (2 to 3 p.c.) is good for disinfecting the hands and also to relieve itching.

In other cases the vehicle represents a kind of dressing. Among the *Pastes*, the zinc-starch-vaseline paste, with corresponding medication, takes a high place. This paste is used with good result in combination with salicylic acid (acid salicyl., 1–2; zinci oxidi et amyli, aa 25; vaselini, 50). The paste adheres to the face without any bandage; it is also dusted with starch. In the *Traumaticin* treatment, traumaticin (a solution of one part of gutta-percha in ten to fifteen parts of chloroform) is used as a medium for applying different remedies, such as chrysarobin, etc. It forms a pliant coating and surpasses collodion by far in this respect.

Glycero-Gelatin is prepared in three forms: Soft (5 p.c. gelatin added), hard (10 p.c. gelatin and water) and hard (10 p.c. gelatin

without water). Before using the preparation is liquefied by heat, and in this condition is spread on to the part affected by means of a brush and covered with mull.

In the preparation of Ointment and Plaster Mulls, Unna's recommendation is followed to replace lard by mutton fat, which renders unnecessary additions of paraffin or wax. The dressings are dipped into the melted mass, dried and rolled up. The gutta-percha mull is considered to present many advantages.

A new kind of dermatological plaster has been introduced, the basis of which consists of purified india-rubber and anhydrous lanolin worked up together to a remarkably adhesive mass. The mixture is medicated with various substances and spread upon linen and is then known as *Collemplastrum*. Among the advantages claimed for this kind of plaster are its low cost, that the mass does not separate from the linen, that while possessing the adhesive properties of india-rubber plaster, the lanolin favours the absorption of the added medicament, and that the plaster can be readily removed without leaving portions adherent to the skin. Besides the simple *collemplastrum adhæsivum*, others are used containing respectively 10 to 20 per cent. of salicylic acid, 30 per cent. of pyrogalllic acid, 60 per cent. of mercury, 60 per cent. of mercury and 5 per cent. of carbolic acid, 50 per cent. of thiol, 40 per cent. of zinc oxide, 10 per cent. of liquid pitch, etc.

Medicated Oils for Hypodermic Injection. A. Vicario. (*American Druggist*, June 15, 1891.) Several fixed oils, particularly those of olive and almonds, have for some time past been used by numerous practitioners as vehicles for the hypodermic administration of certain remedies.

In a recent issue of *Le Progrès Thérapeutique*, the author points out the necessity of carefully sterilizing the respective liquids, and gives various practical hints, which are summarized in the following :—

Preparation of the Solutions.—This is either made by simply mixing the ingredients, if liquid, or by producing solution by means of a water bath, in which latter case the most volatile substance must be added after the others have become liquid.

Sterilization of the Solutions.—The liquid is placed in a sterilizing flask. [Pasteur's retort or Chamberland's pipette flask is mentioned by the author. Any bottle with a long and narrow neck, which can be closed with a pellet of cotton, may be used.] The flask is then heated in a sterilizing oven at a temperature of 120° C.

Filling into Bottles.—The liquid is now transferred, under proper precautions, into previously sterilized small bottles. If a Chamberland's flask is used, which has a bent neck and is drawn out to a fine tube fused at the end, the latter is broken off after sterilization is completed, the tube pushed through the cotton stoppers of the small bottles, and the liquid thus transferred without risk of re-introducing germs or bacteria.

Formulae.—The most usually employed preparations, which are particularly used in *phthisis*, are the following :

Picot's Solution.

Guajacol	. . . . .	5 grams.
Iodoform	. . . . .	1 gram.
Olive oil,		
Liquid vaseline,	aa eq. parts to make	100 c.c.

Pignol's Solution.

Eucalyptol	. . . . .	14 grams.
Guajacol	. . . . .	5 "
Iodoform	. . . . .	1 gram.
Olive (or almond oil), to make	. . . . .	100 c.c.

Morel-Lavallée's Solution.

Eucalyptol	. . . . .	12 grams.
Guajacol	. . . . .	5 "
Iodoform	. . . . .	4 "
Olive oil, to make	. . . . .	100 c.c.

The hypodermic dose of these solutions is from 3 c.c. to 12 c.c. in twenty-four hours. Besides the above, there are also in use plain solutions, in olive or almond oil, of creasote (1 : 15), eucalyptol (2 or 4 : 10), etc.

Solution for Softening Ear-Wax. (*Amer. Journ. Pharm.*, August, 1890.)

La Clinique recommends a solution prepared as follows :—

Boric acid	. . . . .	0.6 gram.
Glycerine	. . . . .	15 grams.
Water	. . . . .	15 "

The solution is warmed, and 5 to 10 drops are put into the ear twice a day.

Lip Salve in Sticks. (*Zeitschr. des æsterr. Apoth. Ver.*)

Paraffin	6 drachms
Cocoa butter	6 "
White vaseline	1 oz.
Eosin	1 grain
Otto of roses	5 drops

Melt the solids and add the vaseline. Dissolve the eosin in alcohol, and add to the mixture, also the perfume, and cast into suitable-sized sticks.

Rose Powder. (*Chemist and Druggist*, August 30, 1890.)

Lard	3 lbs.
Spermaceti	3 oz.
Almond oil	3 "
Otto of roses	30 drops
Oil of rose geranium	30 "
" " bitter almonds	30 "

Colour with alkanet.

New Formulæ for Perfumes. (*Chemist and Druggist*, September 13, 1890.)

New-mown Hay.

Coumarin	2 grains
Vanillin	1 grain
Tincture of orris (1 in 12)	4 oz.

Mix.

Heliotrope.

Heliotropin	15 grains
Jasmine extract	6½ oz.
Otto of roses	4 drops
Oil of bitter almonds	2 "
Tincture of musk	4 "
Ess bouquet	3 oz.

Mix.

Ess. Bouquet.

Tincture of orris	1 oz.
Jasmine extract	5½ "
Otto of roses	4 drops
Oil of neroli	2 "
Tincture of musk	40 minims
Spirit, sufficient to make	4 pints

Mix.

A Superior Bouquet. (*Chemist and Druggist*, November 8, 1890.)

Herrburger gives the following:—

Triple extract of jasmine	1½ drachm
Oil of bergamot	50 drops
„ „ lemon	5 „
„ „ lavender	3 „
„ „ cloves	1 drop
„ „ orris	1 „
Civet	¼ grain
Coumarin	¼ „
Heliotropin	⅓ „
Spirit	5 oz.

Mix and dissolve.

New Perfumes. H. Kraetzer. (*American Druggist*, July 15, 1891.)

1. *Bouquet d'Amour.*

Oil of lavender, finest	1,200 grains.
„ „ cloves, twice rectified	600 „
„ „ rose	15 „
„ „ bergamot	600 „
Tinct. vanilla	6 fl. oz.
„ „ ambergris	6 „
Alcohol (deodorized)	12½ pints.

2. *Chypre* (for the handkerchief).

Oil of Rosemary, finest	1,080 grains.
„ „ orange, bigarade	2,160 „
„ „ petitgrain	1,260 „
„ „ bergamot	2,340 „
„ „ limetta	2,250 „
„ „ neroli, petale	450 „
Alcohol (deodorized)	49½ pints.
Distilled water	24½ „

Digest the oils with the alcohol for four or five days, then add the distilled water.

3. *Ylang-ylang Extract.*

Oil of ylang-ylang	370 grains.
„ „ neroli, petale	48 drops.
„ „ rose	115 „
„ „ lemon	48 „
Musk	16 „
Alcohol (deodorized)	30 pints.

Methylal as a Solvent for Odorous Principles. (*Chem. Zeitung*, October 29, 1890, 1474.) Methylal is recommended as a solvent for the extraction of odorous principles from flowers, etc., for which purpose it seems to be very efficient, and to have the advantage of a low boiling point and of volatilizing readily and completely. Practical experiments upon violet flowers are reported to have resulted satisfactorily, and it is expected that methylal will come into use for the purpose on an industrial scale.

Benzin Jelly. (*Chemist and Druggist*, August 23, 1890.) Benzin jelly for removing grease spots, may be made, according to the *Pharmaceutical Era*, according to any one of the following:—

- | | |
|----------------------------------|-------------|
| 1. Tincture of soap bark | 12 fl. drs. |
| Benzin to make | 8 fl. ozs. |

Mix and shake for half an hour, then allow to stand twelve hours to solidify.

- | | |
|---|------------|
| 2. Infusion of soap bark (20 per cent.) | 4 fl. drs. |
| Benzin | 2 fl. ozs. |

Proceed as above.

3. 120 grams of white soap are dissolved in 180 grams of hot water in a litre bottle, and 30 grams of ammonia added. The solution is then made up to three-fourths of the bottle by the addition of water, and the whole shaken up. A teaspoonful of this mixture is placed in a bottle holding 8 oz., and mixed therein with some benzin, and afterwards the bottle is filled with benzin under protracted shaking.

Caoutchouc Solutions. W. Lascelles. (*Pharm. Centralhalle*, 1890, 654.) Caoutchouc solutions may be readily made by adding to the solvents, benzol, carbon bisulphide, etc., certain volatile oils, especially eucalyptus oil. Mixtures containing 96 to 92 parts of benzol and 4 to 8 parts of eucalyptus oil, or 95 parts of carbon bisulphide and 15 parts of eucalyptus oil, will easily dissolve 16 to 20 parts of caoutchouc.

Soap for Removing Stains. (*Amer. Journ. Pharm.*, January, 1891.) A good soap for removing stains can be made by rubbing together 30 parts each of borax and quillaia extract made by exhausting the ground bark with boiling water and evaporating to syrupy consistence (100 parts of bark usually yield 20 parts of extract), and adding 120 parts of fresh ox-gall; this mixture is then incorporated with 450 parts of melted soap, and the mass poured into suitable moulds.

Furniture Polish. (*Chemist and Druggist*, May 23, 1891.)*A Red Polish.*

Oil of turpentine	16 oz.
Alkanet	4 drachms.
Beeswax	4 oz.

Digest the alkanet in the oil until the latter is sufficiently coloured; then scrape the beeswax fine and form a homogeneous mixture by digestion over a water-bath.

For a pale polish omit the alkanet.

Russian Furniture Varnish. (*Chemist and Druggist*, May 9, 1891.)

Shellac	30 oz.
Colophony	2 „
Venice turpentine	6 „
Spirit	90 „

Mix, and shake occasionally until dissolved; then set aside in a warm place for a few weeks, and filter.

Window-Polishing Paste. E. Dieterich. (*Chemist and Druggist*, May 9, 1891.)

Prepared chalk	90 parts.
White bole	5 „
Armenian bole	5 „

Rub together into a smooth paste with—

Water	50 „
Spirit	25 „

Cement. (*American Druggist*. From *Chem. Centr.*) According to Winchell, a superior cement or paste may be prepared as follows:—

Gum arabic	4 parts.
Starch	3 „
Sugar	1 part.
Water	q.s.

Soak the gum in water, using a quantity sufficient for the gelatinization of the starch and the solution of the sugar. When the gum is thoroughly soaked or dissolved, add the starch and sugar, and heat on a water-bath. The cement has the consistence

of tar, and retains this also when cold. It is preserved by adding to it a little oil of sassafras.

This cement may be used for general purposes, and also upon objects with a polished surface; likewise for cementing broken porcelain, minerals, etc.

Ink for Rubbler Stamps. E. Dieterich. (*Pharm. Manual*, 1891.) (a) *Liquids*.—Make a mixture of 10 parts of water, 10 of alcohol, 10 of wood vinegar, and 70 of glycerine. For every 100 parts of this liquid use the amounts of colouring matter mentioned in the succeeding list.

(b) *Colours*.—*Blue*: Aniline blue 1 B, 3 parts. *Violet*: Methyl violet 3 B, 2 parts. *Cherry red*: Diamond Fuchsin I, 2 parts. *Orange red*: Eosin BBN, 3 parts; as this colour does not stand acids, the wood vinegar must here be omitted. *Green*: Aniline green D (q.s.). *Brown*: Vesuvine B, or Bismarck brown (q.s.). *Black*: Deep-black E (q.s.).

Ink for Writing on Zinc. (*Chemist and Druggist*, August 30, 1890.) Dieterich gives the following as a reliable formula:—

Chloride of potassium	3 parts.
Sulphate of copper	6 "
Distilled water	70 "

Dissolve, and mix with the following:—

Aniline blue (water soluble)	15 "
Dilute acetic acid	5 "
Distilled water	20 "

Ozonin. L. Schreiner. (*Chem. Zeit.*, 1890, 1004.) Ozonin, a bleaching fluid, patented by the author, is made as follows: 125 parts of resin are dissolved in 200 parts of oil of turpentine; to this solution is added a solution of 22.5 parts of potassium hydrate in 40 parts of water, also 90 parts of hydrogen peroxide. The resulting jelly exposed to light changes in two or three days into a thin fluid called *ozonin*; this same change takes place in the dark, but then requires some weeks for its completion. A solution of one gram of ozonin in one litre of water acts as an energetic bleaching agent on fibres, wood, straw, cork, and paper; also on solution of gums and soaps; the bleaching effect is as energetic in acid as in alkaline solutions.

The Bleaching of Beeswax. A. Buisine and P. Buisine. (*Bull. de la Soc. Chim.* [3], iv. 465-470.) In the bleaching of

beeswax light is the chief factor, since the bleaching goes on in a vacuum, or in an atmosphere of carbonic anhydride, nitrogen, etc., but ceases in the dark even in an atmosphere of ozone. Pure beeswax becomes brittle when bleached by exposure; and to prevent this, it is customary to add 3 to 5 per cent. of suet, which also expedites the bleaching process; the addition of turpentine oil has a similar effect. Other agents made use of are: Potassium permanganate, potassium bichromate, hydrogen peroxide, and animal charcoal.

Adulterated Carmine. (From *Chemist and Druggist*.) Attention is called to the fact that there is a carmine met with in commerce which is a mixture of lead eosin, china clay, and lead sulphate. It is only partially soluble in solution of ammonia, and the solution is strongly fluorescent. Another kind consists of a mixture of baryta and red corallin.

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TRANSACTIONS
OF THE
British Pharmaceutical Conference
AT THE
TWENTY-EIGHTH ANNUAL MEETING
AT
CARDIFF
1891.

C O N T E N T S.

CONSTITUTION AND RULES OF THE CONFERENCE.

ALPHABETICAL LIST OF MEMBERS' NAMES AND ADDRESSES.

PROGRAMME OF TRANSACTIONS OF THE CONFERENCE AT CARDIFF, 1891,
INCLUDING TITLES OF PAPERS.

THE TRANSACTIONS OF THE CONFERENCE, INCLUDING THE PAPERS READ,
AND DISCUSSIONS THEREON.

GENERAL INDEX TO THE YEAR-BOOK AND TRANSACTIONS.

British Pharmaceutical Conference.

CONSTITUTION.

Art. I.—This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following :—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.

2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.

3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

6. At each Conference it shall be determined at what place and time to hold that of the next year.

7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.

8. The Executive Committee shall present a report of proceedings annually.

9. These rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

* * * Authors are specially requested to send the titles of their Papers to The Hon. Gen. Secs. Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.

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 Thompson, Mr. J., 11, Aldersgate Street, E.C.
 Thompson, Mr. J., 58, Hanover Street, Liverpool.
 Thompson, Mr. L., Lisnaskea, County Fermanagh, Ireland.
 Thomson, Mr. Isaac W., 4, Bellevue Street, Edinburgh.
 Thomson, W., F.I.C., F.R.S.E., Royal Institution, Manchester.

- Thorburn, Mr. H. Wm., 3, Newgate Street, Bishop Auckland.
 Thornton, Dr. H., 338, Leeds Road, Bradford, Yorks.
 Thorp, Mr. J., 66, Heaton Moor Road, Heaton Chapel, near Stockport.
 Thorp, W., B.Sc., F.I.C., F.C.S., 24, Crouch Hall Road, Crouch End, N.
 Thresh, John C., M.B., D.Sc., Chelmsford, Essex.
 Thurland, Mr. H., 41, St. Giles Road, Oxford.
 Tichborne, Prof. C. R. C., Ph.D., F.I.C., F.C.S., 15, North Great Georges Street, Dublin.
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 Tily, Mr. C. A., 45, Maida Vale, W.
 Tipping, Mr. T. J. W., 155, High Street, Stoke Newington, N.
 Tipton, Mr. St. J., St. George's, Wellington, Salop.
 Tirrell, Mr. J., Market Square, Hanley.
 Tocher, Mr. J. F., 1, Chapel Street, Peterhead, N.B.
 Todd, Mr. J., Alexandra Terrace, Hylton Road, Sunderland.
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 Toone, Mr. J. A., 39, Old Christchurch Road, Bournemouth.
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 Townsend, C., J.P., 4, Union Street, Bristol.
 Trigg, Mr. J. W., Barton Street, Gloucester.
 Troake, Mr. R. J., 126, White Ladies' Road, Clifton, Bristol.
 Troke, Mr. C., 82, City Road, E.C.
 Truman, Mr. H. V., 187, Newington Butts, S.E.
 Tull, Mr. F. C., 135, Peaseod Street, Windsor, Berks.
 Tully, Mr. J., senr., Glen Vue Works, East Grinstead, Sussex.
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 Turnbull, Mr. H. J., Tavistock Warehouse, Sunderland.
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 Turner, Mr. J., 15, Fore Street, Hexham.
 Turner, Mr. J., The Limes, Aylesbury.
 Turner, Mr. W. S., 225, Oxford Street, Manchester.
 Turton, Mr. Wm., 93 & 95, St. Peter's Street, Leeds.
 Twemlow, Mr. R., 91, Upper Brook Street, Manchester.
 Twiss, Mr. W., Hunstanton, Norfolk.
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 Tyrer, Mr. P., 70, Long Lane, Borough, S.E.
 Tyrer, Thos., F.I.C., F.C.S., Stirling Chemical Works, Abbey Lane, Stratford, E.
 Umney, C., F.I.C., F.C.S., 50, Southwark Street, S.E.
 Umney, Mr. John C., care of Messrs. Wright, Layman & Umney, 50, Southwark Street, S.E.
 Upton, Mr. E. J., Wallingford, Berks.
 Urwick, Mr. W. W., 60, St. George's Road, Pimlico, S.W.
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 Webb, Mr. J. H., Napier Road, Luton, Beds.
 Weddell, Mr. George, 20, West Grainger Street, Newcastle-on-Tyne.
 Weld, Mr. C. C., Messrs. Burroughs, Wellcome & Co., Snow Hill Buildings, Holborn Viaduct, E.C.
 Wellcome, Mr. H. S., 7, Snow Hill, Holborn Viaduct, E.C.
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 Westlake, Mr. J., 53, High Street, Sutton, Surrey.
 Weston, Mr. C., 2, High Street, Ventnor, Isle of Wight.
 Weston, Mr. S. J., 151, Westbourne Terrace, W.
 Westrup, Mr. J. B., 76, Kensington Park Road, W.
 Wheeldon, Mr. J., 241, Stockport Road, Manchester.
 Wheeler, Mr. J. W., 10, New Bond Street, W.
 Whigham, Mr. R. L., 22, Brook Street, London, W.
 Whiston, Mr. E., 37, St. James' Square, Bath.
 Whitby, Mr. A., 468, Stratford Road, Birmingham.
 White, Mr. Arthur F., 61, Sunbridge Road, Bradford, Yorks.
 White, Mr. E., St. Thomas's Hospital, London, S.E.
 White, Mr. E. A., Mayfield, Sussex.
 White, Mr. G., 55, High Street, & 115, Hall Street, Dudley.
 White, Mr. J. F., 13, Blenheim Terrace, Leeds.
 Whitfield, J., F.C.S., 113, Westborough, Scarborough.
 Whitla, Mr. M. R., Medical Hall, Monaghan.
 Whitla, W., M.D., L.A.H., 8, College Square North, Belfast.
 Whitmore, W. T., F.R.C.S. Ed., 7, Arlington Street, Piccadilly, S.W.
 Whittle, Mr. S., 18, Market Street, Leigh, Lancashire.
 Whysall, Mr. W., Grantham.
 Whyte, Mr. J. S., 57, Guthrie Port, Arbroath, N.B.
 Wiggins, Mr. H., 236, Southwark Park Road, S.E.
 Wild, Mr. F., 285, Oxford Street, Manchester.
 Wild, Mr. John, 225, Oxford Street, Manchester.
 Wilford, Mr. J., 31, Lower Parliament Street, Nottingham.
 Wilkinson, Mr. B. J., 7, Middleton Road, Kingsland, N.E.
 Wilkinson, Mr. G., 267, Waterloo Road, Manchester.
 Wilkinson, Mr. W., 28, Crumpsall Terrace, Cheetham Hill, Manchester.
 Will, Mr. W. W., The Laurels, Galveston Road, Putney, S.W.
 Willan, Mr. R., 5, Market Street, Ulverston.
 Willan, Mr. W., 3, Friargate, Preston, Lancs.

- Williams, Mr. E., Cerrig-y-Druidion, Denbighshire.
 Williams, Mr. E., 10, Wrexham Street, Mold.
 Williams, Mr. H.
 Williams, Mr. J. V., 95, Old Town Street, Plymouth.
 Williams, Mr. J. W., 6, Giltspur Street, E.C.
 Williams, Mr. T., 11, Bute Street, Cardiff.
 Williams, T. H., F.C.S., 10, Ascham Street, Kentish Town, N.W.
 Williams, Mr. W. Jesse, Park Hall Buildings, Queen Street, Cardiff.
 Williams, W. Lloyd, A.I.C., Phoenix Mills, Dartford.
 Williamson, Mr. W. H., 72, Elizabeth Street, Manchester.
 Willmott, Mr. W., King's College Hospital, W.C.
 Wills, Mr. G. S. V., Southwood, Croham Road, Croydon.
 Wilson, Mr. E., Silverdale, Staffordshire.
 Wilson, Mr. J., General Infirmary, Derby.
 Wilson, Mr. J., 11, George Street, Bath.
 Wilson, Mr. J. H., 6, West Park, Harrogate.
 Wilson, Mr. T., Stowmarket, Suffolk.
 Wilson, Mr. T. W., 2, Victor Street, Thornbury, Bradford.
 Wilson, H., A.I.C., 88, Bellott Street, Cheetham, Manchester.
 Wing, Mr. G. N., 29, Market Place, Melton Mowbray.
 Wing, Mr. Lewis, Chislehurst, W. Kent.
 Wink, Mr. J. A., 2, Devonshire Square, Bishopsgate Street, E.C.
 Wise, Mr. J. N., 14, Claypath, Durham.
 Wood, Mr. A., New Brentford.
 Wood, Mr. A. W., 3, James Street, Harrogate.
 Wood, Mr. C. G., 30, High Street, Oldham.
 Wood, Prof. C. H., F.I.C., F.C.S., 46, Loraine Road, Holloway, N.
 Wood, Mr. J., 9, Peel Street, Barnsley, Yorks.
 Wood, Mr. R., 50, High Street, Oldham.
 Wood, Mr. R., 25, Mill Street, Macclesfield.
 Woodland, J., F.L.S., F.C.S., etc., St. George's Hospital, S.W.
 Woolford, Mr. J., 61, Kirkgate, Leeds.
 Woolcombe, R.L., L.L.D., F.S.S., M.R.I.A., 14, Waterloo Road, Dublin.
 Woolley, Mr. E. J., 69, Market Street, Manchester.
 Woolley, Mr. G., Sparkenhoe Street, Leicester.
 Woolley, Mr. G. S., 69, Market Street, Manchester.
 Woolley, Mr. Hermann, 69, Market Street, Manchester.
 Woolley, Mr. S. W., 146, High Street, Southampton.
 Woolrich, Mr. C. B., Uttoxeter, Staffs.
 Wootton, Mr. A. C., 42, Cannon Street, E.C.
 Worfolk, Mr. G. W., 16, Brook Street, Ilkley.
 Worrall, J. H., F.I.C., F.C.S., 158, Ellesmere Road, Sheffield.
 Worth, Mr. E., Town Hall, Bournemouth.
 Wrenn, W. A., F.C.S., 15, East Street, Taunton.
 Wright, A., A.K.C., 13, High Street, Yeovil, Somerset.
 Wright, C. R. A., D.Sc., F.R.S., F.I.C., F.C.S., St. Mary's Hospital, W.
 Wright, Mr. G., 102, High Street, Burton-on-Trent.
 Wright, Mr. H. C., 50, Southwark Street, S.E.
 Wright, Mr. R., 11, Eagle Parade, Buxton, Derbyshire.
 Wyatt, Mr., H., 223, Stanley Road, Bootle, Liverpool.
 Wyatt, Mr. W., 4, Stonewell, Lancaster.
 Wybrant, Mr. Andrew, 5, Amwell Street, E.C.
 Wyborn, J. M., F.C.S., 59, Moorgate Street, E.C.
 Wyles, Mr. W., 1, New Bridge, Dover.
 Wyley, Mr. W. F., Hertford Street, Coventry.
 Wylie, Mr. D. N., 1, College Street, Edinburgh.
 Wyman, Mr. J., 25, Charles Street, Farringdon Road, E.C.
 Wynne, Mr. E. P., 7, Pier Street, Aberystwith.

Yates, Mr. D., 32, Darwen Street, Blackburn.

Yates, Mr. F., 64, Park Street, Southwark, S.E.
Yates, Mr. R., 64, Park Street, Southwark, S.E.
Yeatman, Mr. F. J., 141, Kentish Town Road, N.W.
Yeomans, Mr. J., 22, Petty Curv, Cambridge.
Yorath, Mr. T. V., 120, Cowbridge, Road, Cardiff.
Young, Mr. J., 20, High Street, Newport, Mon.
Young, J. R., F.C.S., 42, Sankey Street, Warrington.
Young, Mr. J. R., 17, North Bridge, Edinburgh.
Young, Mr. R. F., New Barnet.

NOTICE.

Members are requested to report any inaccuracies in these lists by letter, addressed as follows :—

THE ASST. SECRETARY,
BRIT. PHARM. CONF.,
17, Bloomsbury Square,
London, W.C.

SOCIETIES AND ASSOCIATIONS

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

The Pharmaceutical Society of Great Britain.

The North British Branch of the Pharmaceutical Society of Great Britain.

The Pharmaceutical Society of Ireland.

ABERDEEN AND NORTH OF SCOTLAND.—Society of Chemists and Druggists (1839).
Mr. A. Strachan, 138, Rosemount Place, Aberdeen.

BIRMINGHAM.—Midland Counties Chemists' Association (1869). Messrs. Chas. Thompson and F. H. Alcock, F.C.S., 159, Stratford Road, Birmingham.
Chemists' Assistants' Association (1868), Birmingham.

BRIGHTON.—Association of Pharmacy (1861). Mr. Marshall Leigh, 46, Dyke Road, Brighton.

BRISTOL.—Pharmaceutical Association (re-established 1869). G. F. Schacht, F.C.S., 7, Regent Street, Clifton, Bristol.

COLCHESTER.—Association of Chemists and Druggists (1845). Mr. J. C. Shennstone, 13, High Street, Colchester.

DOVER.—Chemists' Association. Mr. R. M. Ewell, 37, Town Wall Street, Dover.

DUNDEE.—Chemists and Druggists' Association (1868). Mr. J. Russell, 111, Nethergate, Dundee.

EDINBURGH.—Chemists' Assistants' Association. Mr. J. K. Hill, 36, York Place.

EXETER.—Exeter Pharmaceutical Society (1845). Secretary, 41, High Street, Exeter.

GLASGOW.—Chemists and Druggists' Association (1854). Mr. J. Arnot, 34, Virginia Street, Glasgow.

HALIFAX.—Halifax and District Chemists and Druggists' Association (1868). Mr. J. B. Brierley, Halifax.

HASTINGS.—Chemists' Association (1884). Mr. A. N. Beck, 11, York Buildings, Hastings.

HAWICK.—Pharmaceutical Association. Thomas Maben, F.C.S., 5, Oliver Place, Hawick.

HULL.—Chemists' Association (1868). Mr. C. B. Bell, 6, Spring Bank, Hull.

LEEDS.—Chemists' Association (1862). F. W. Branson, F.I.C., F.C.S., 14, Commercial Street, Leeds.

LEICESTER.—Leicester and Leicestershire Chemists' Association. Mr. J. J. Edwards, 43, The Newarke, Leicester.

LIVERPOOL.—Chemists' Association (1868). A. H. Samuel, F.C.S., 145, Upper Parliament Street, Liverpool.

LONDON.—Chemists' Assistants' Association. Secretary, 103, Great Russell Street, W.C.

MANCHESTER.—Pharmaceutical Association. H. Wilson, A.I.C., 83, Bellott Street, Cheetham.

NEWCASTLE-UPON-TYNE.—North of England Pharmaceutical Association. Mr. Chas. B. Ford, Durham College of Science, Barras Bridge.

NOTTINGHAM.—Nottingham and Notts Chemists' Association (1863). Mr. W Widdowson, Sherwood Street North, Nottingham.

OLDHAM.—Chemists' and Druggists' Assistants and Apprentices' Association (1870). Mr. C. G. Wood, Secretary, Church Institute, Oldham.

SHEFFIELD.—Pharmaceutical and Chemical Society (1869). Mr. C. O. Morrison, 137, West Street, Sheffield.

SUNDERLAND.—Chemists' Association (1869). Mr. J. Harrison, 33, Bridge Street, Sunderland.

YORK.—Chemists' Association (1865). Mr. Montague Folkard, 9, High Ousegate, York.

**PRESENTATION COPIES OF THE YEAR-BOOK OF PHARMACY ARE
FORWARDED TO THE FOLLOWING :—**

The Honorary Members.

Librarians.

American Pharmaceutical Association; Chemical Society of London; Ecole Supérieure de Pharmacie, Montpellier; Ecole Supérieure de Pharmacie, Paris; Massachusetts College of Pharmacy; The Mason College, Birmingham; Missouri College of Pharmacy; New Zealand Board of Pharmacy; North British Branch of the Pharmaceutical Society; Pharmaceutical Society of Great Britain; Pharmaceutical Society of Ireland; Pharmaceutical Society of New South Wales; Ontario College of Pharmacy, Toronto; Pharmaceutical Society of Australasia; Pharmaceutical Society of Queensland; Royal Society of London; Société de Pharmacie, Paris; State of Illinois Board of Pharmacy; Yorkshire College of Science.

Provincial Associations (having Librarians).

Aberdeen Society of Chemists and Druggists; Brighton Chemists' Association; Bristol Pharmaceutical Association; Colchester Association of Chemists and Druggists; Dover Chemists' Association; Dundee Chemists and Druggists' Association; Edinburgh Chemists' Assistants' Association; Glasgow Chemists and Druggists' Association; Halifax and District Chemists and Druggists' Association; Hastings Chemists' Association; Hawick Chemists' Association; Hull Chemists' Association; Leeds Chemists' Association; Leicester and Leicestershire Chemists' Association; Liverpool Chemists' Association; London Chemists' Assistants' Association; Manchester Chemists and Druggists' Association; Midland Counties Chemists' Association; North of England Pharmaceutical Association; Nottingham and Notts Chemists' Association; Oldham Chemists and Druggists' Assistants and Apprentices' Association; Sheffield Pharmaceutical and Chemical Association; Sunderland Chemists' Association; York Chemists' Association.

Journals.

American Druggist; American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; Lancet; Medical Press and Circular; The National Druggist; Nature; Pharmaceutical Journal; Pharmaceutische Centralhalle; Répertoire de Pharmacie; Revista Farmaceutica.

THE FOLLOWING JOURNALS ARE RECEIVED FROM THEIR RESPECTIVE EDITORS :—

American Druggist; American Journal of Pharmacy; Archives de Pharmacie; Archiv der Pharmacie; Australasian Journal of Pharmacy; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; National Druggist; Pharmaceutical Journal; Pharmaceutical Record; Pharmaceutische Centralhalle; Proceedings of the American Pharmaceutical Association; Répertoire de Pharmacie; Revista Farmaceutica.

PROGRAMME OF THE PROCEEDINGS OF THE BRITISH PHARMACEUTICAL CONFERENCE AT THE TWENTY-EIGHTH ANNUAL MEETING, CARDIFF, 1891.

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PAVE, CHARLES, Newport. [church.
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PHILLIPS, J. W., Newport.
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D.Sc., Cardiff.
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YACVELL, CHAS. TANFIELD, M.D.,
Cardiff.
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WILLIAMS, THOMAS, Cardiff.
WILLIAMS, W. JESSE, Cardiff.
WOOD, GODFREY C., Pontypool.
YOUNG, JOHN, Newport.
YORATH, ALDERMAN T. V., Cardiff.

THE SITTINGS OF THE CONFERENCE WERE HELD IN THE
LECTURE THEATRE OF THE UNIVERSITY COLLEGE, CARDIFF,
ON TUESDAY & WEDNESDAY, AUGUST 18th AND 19th, 1891,
Commencing at Ten a.m. each day.

MONDAY, 17th AUGUST.

The EXECUTIVE COMMITTEE met, according to notices from the Honorary General Secretaries, at 10 p.m., at the Town Hall, Cardiff.

TUESDAY, 18th AUGUST.

The CONFERENCE met at 10 a.m., adjourning at 1 p.m.: and at 2 p.m. adjourning at 4 p.m.

Order of Business.

Address of Welcome by the Mayor of Cardiff (The Most Hon. The Marquess of Bute, K.T.).

Reception of Delegates.

Report of Executive Committee.

Financial Statement.

Report of Treasurer of the "Bell and Hill's Library Fund."

President's Address.

Reading of Papers and Discussions thereon.

PAPERS.

1. *Report of Unofficial Formulary Committee.* By THE PRESIDENT.
2. *Report on Ipecacuanha.* Part I.—*General Proximate Analysis.* By R. A. CRIPPS and A. WHITBY.
3. *Preparations of Ipecacuanha.* By W. H. SYMONS.
4. *Note on Extractum Euonymi Siccum.* By M. CONROY, F.C.S.
5. *Indian Gums for Pharmacy Work.* By Dr. S. RIDEAL, F.I.C., F.C.S., F.G.S., and W. E. YOULE.
6. *Note on the Estimation of the Volatile Oil of Copaiba.* By R. A. CRIPPS F.I.C.
7. *Liquid Persian Galbanum.* By E. M. HOLMES, F.L.S.
8. *The Present and Future Water Supply of Cardiff.* By THOMAS HUGHES, F.I.C., F.C.S.
9. *On the Alkaloidal Value of some Commercial Henbane.* By A. W. GERARD, F.C.S.
10. *Note on the Constituents of Henbane Seed.* By F. RANSOM, F.C.S.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon.

At 5 p.m. members and friends proceeded by steamer to Barry. After a tour through the town they took tea at the Barry Dock Hotel, and returned to Cardiff at 8 p.m.

WEDNESDAY, 19th AUGUST.

The CONFERENCE met at 10 a.m., adjourning from 1 p.m. till 2 p.m. The whole of the business of the Conference was completed this day by about 4 p.m.

Order of Business.

Reception of Delegates.

Reading of Papers, and Discussions thereon.

PAPERS.

11. *Glacial Phosphoric Acid.* By J. HODGKIN, F.I.C., F.C.S., F.L.S.
12. *Note on a Proposed Method of Standardising the Extracts of Nux Vomica and Opium.* By M. CONROY, F.C.S.
13. *Suggestions for the Assay of Preparations of Aconite.* By A. H. ALLEN, F.I.C., F.C.S.
14. *Some Notes on Oil of Eucalyptus and Eucalyptol.* By R. H. DAVIES, F.I.C., F.C.S., and T. H. PEARMAIN.
15. *Cascara Sagrada and Extracts, with special reference to question 8 on the Blue List.* By JOHN MOSS, F.I.C., F.C.S.
16. *Castor Oil and Extract of Malt.* By S. M. BURROUGHS.
17. *The Opium used in Medicine.* By E. M. HOLMES, F.L.S.
18. *Report upon Medicated Lozenges, B.P.* By FREDERICK DAVIS, B.S.
19. *Note on Dispensing Liquor Strychnina.* By T. SHEPHEARD.
20. *The Solvent Action of Alcohol of different degrees of strength on some of the Drugs used in making Pharmacopœial Tinctures. Note (c.) on Tincture of Henbane.* By R. WRIGHT and E. H. FARR.

Presentation from Bell and Hill's Fund.

Election of Formulary Committee.

Place of Meeting for 1892.

Election of Officers for 1891-92.

There was a mid-day adjournment between 1 and 2 p.m. for luncheon.

At 4.15 p.m. members and their friends drove to Caerphilly Castle, and in the large hall of this interesting ruin partook of afternoon tea, provided by the generosity of the Marquess of Bute.

THURSDAY, 20th AUGUST.

At 9.30 a.m. on Thursday about 150 members of the Conference, under the guidance of the Local Committee, were conveyed from the Great Western Railway station by special train to Lydney, and from there by special train to Speech House, Forest of Dean, where an excellent luncheon awaited them. After lunch the journey was resumed to Symonds Yat, tea being served at Rocklea House.

The return journey was made by special train *via* Monmouth and Tintern, Cardiff being reached about 9 p.m.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING AT CARDIFF, 1891.

THE Twenty-eighth Annual Meeting of the British Pharmaceutical Conference commenced its sittings on Tuesday, August 18th, in the Lecture Theatre of the University College, Cardiff. W. Martindale, Esq., F.C.S., in the chair.

The following members and friends were present during the meeting :—

Aberdare—Thomas, D. ; Thomas, W. J.

Aberdeen—Kay, J. P.

Belfast—Payne, J. C. C.

Birmingham—Barclay, J. ; Southall, A.

Bolton—Forbes, J. W.

Bournemouth—Hardwick, S. ; Spinney, E. ; Toone, J. C.

Bradford—Newbould, J. M. ; Silson, R. W.

Bridgend—Griffiths, B.

Brighton—Leigh, M. ; Pears, W. W. K. ; Savage, D.

Bristol—Stroud, J.

Cardiff—Anthony, D. ; Coleman, A. ; Duck, W. G. ; Furnell, W. ; Furnival, W. H. ; Glyde, T. ; Hagon, A. ; Hughes, T. ; Johnstone, F. S. ; Jones, J. A. ; Munday, J. ; Mumford, R. ; Prust, R. ; Sanders, W. J. ; Williams, W. J. ; Yorath, T. V.

Chepstow—Clarke, C. H.

Clifton—Schacht, G. F. ; Towerzey, A.

Coventry—Hinds, J. ; Sutton, R.

Dalkey—Beggs, G. D., and Mrs. Beggs.

Droitwich—Harris, S.

Edinburgh—Boa, Peter ; Dott, D. B. ; Coats, J.P.

Exeter—Dalglish, H. J.

Ferndale—Thomas, D.

Gloucester—Stafford, W.

Godalming—Edward, S.

Grantham—Whysall, W.

Hitchin—Ransom, F.

Leicester—Meadows, J.

Liverpool—Bain, J.; Conroy, M., and Mrs. Conroy; Ward, J. S.

Llanelly—Evans, G.

London—Arkinstall, W.; Bird, F. C. J.; Bremridge, R.; Burroughs, S. M.; Clarke, C. G.; Collier, H.; Davies, R. H.; Drysdale, J. W.; Gerrard, A. W.; Green, Prof.; Hall, H. C.; Harrison, Miss; Hodgkin, J.; Holding, J.; Johnson, M. K.; Knight, S. J.; MacEwan, Peter; Maitland, P. C.; Martindale, W.; Mrs. W. Martindale; Martindale, W., Junr.; Mason, A. H.; Matthews, J. H.; Miles, C. I.; Naylor, W. A. H.; Rideal, S., Dr.; Robinson, W. P.; Short, F. W.; Miss Short; Stevens, P. A.; Strother, J. C.; Tanner, A. E.; Taylor, G. S.; Tingle, J. G.; Tyrer, T.; Umney, J. C.; Wellcome, H. S.; Whigham, R. L.; Williams, T. H.; Mrs. T. H. Williams; Williams, W. T.; Wright, T. R.; Yeatman, F. J.

Merthyr—Harris, E. W.

New Barnet—Young, J. R.

Newport—Giles, W. E.

Nottingham—Patchitt, E.

Porth—Davies, T.

Radcliffe—Smith, J. T.

Salisbury—Atkins, S. R.

Sheffield—Allen, A. H.

Shrewsbury—Blunt, T. P., and Mrs. Blunt.

Swansea—Grose, H. M.; Hughes, J.; Thomas, G.

Swindon—Green, J.

West Norwood—Drane, W.

Wigan—Johnson, T.; Phillips, J.

Woolwich—Gwinnell, E.

York—Clark, J.

MEETING OF THE EXECUTIVE COMMITTEE.

A meeting of the Executive Committee was held at the Town Hall, Cardiff, on Monday, August 17, at 10 p.m.

Present:—Mr. Martindale (President), in the chair; Professor Green, Messrs. Anthony, Atkins, Coleman, Dott, Gerrard, Munday and Schacht; Alderman Yorath, Mr. Davies (Hon. Treasurer),

Messrs. Naylor and Ransom (Hon. Gen. Secs.), and Mr. Johnson (Assist. Sec.).

The minutes of the previous meeting were read and confirmed.

A draft report for presentation at the annual meeting was submitted by the Hon. Gen. Secs. and agreed to.

The Treasurer's financial statement for the year 1890-91 was read and approved.

A proposed list of officers for the ensuing year was adopted for recommendation to the general meeting for election.

The question of the advisability of continuing to hold the Conference at the same place and about the same time as the British Association was brought forward. As, however, the invitation to members at the last meeting of the Conference to ventilate the subject during the year had not resulted in any decided expression of opinion, it was thought best to postpone the discussion of the question in general meeting until next year.

There being no Chemists' Association in the town, it was decided, at the suggestion of the Local Committee, that the books purchased with the Bell and Hills Fund should be placed in the Cardiff Free Library, where the chemists of the district should have free access to them.

The programme for the proceedings of the sittings of the Conference was considered and agreed to.

The following seventeen gentlemen were duly nominated and elected to membership.

Cheney, H. C., Porto Alegre, Brazil.	Newbould, J. M., Bradford.
Boa, Peter, Edinburgh.	Short, F. W., B.Sc., London.
Ewing, J. L., Edinburgh.	Rideal, Dr. S., F.I.C., F.C.S., F.G.S., London.
Hewlett, J. C., London.	White, E., London.
Holloway, E. A., Torquay.	Whigham, R. L., London.
Horsfield, F., Leeds.	Whitby, A., Birmingham.
Horneman, M., Cape Town.	Yeatman, F. J., London.
Josty, W., Riverside, Cardiff.	Lalaseur, P. W., Mitcham.
Mumford, R., Cardiff.	

GENERAL MEETING.

Tuesday, August 18th.

The Conference assembled for its Twenty-eighth Annual Meeting in the Chemical Lecture Theatre of the University College, Cardiff, on Tuesday morning, August 18th, W. Martindale, Esq., F.C.S., President, in the chair.

The Marquess of Bute rose to open the proceedings. He said: It is my pleasing duty to bid an official welcome to the British Pharmaceutical Association. In view of the series of interesting items of business which is immediately to begin, you will not, I am sure, be obliged to me if I waste your time by making a speech. At the same time, I hope that the cordiality of the feelings of the inhabitants of Cardiff towards such an association is too evident to need any words of mine to emphasise it. I will, therefore, with your permission, say nothing more, except to express the hope, in the name of all the people of Cardiff, that the visit of this Association may be as agreeable to its members as we feel sure that it will be profitable, and, in the name of the town, to bid you a most hearty welcome.

The PRESIDENT: My Lord, Mr. Mayor, I am glad to know, sir, that you have given us such a kind and hearty welcome to this important town. It is one, I understand, in which you take great interest, and that you bestow so much of your time, talents, and energy on this great centre that has increased so largely within the last twenty years. The important question of education has been brought prominently to the front in this district of late, and our meeting, in this building of the University College of South Wales, I trust, will foreshadow great help to the cause of education in this important district, and with the higher interests of those more especially connected with it. We are much obliged to you, my lord, and thank you for the kind welcome you have given us.

Reception of Delegates.

Mr. W. A. H. Naylor (Hon. Gen. Sec.) then read the list of delegates who had been appointed by different Societies to attend the Conference.

Pharmaceutical Society of Great Britain.—The President, M. Carteighe; Vice-President, Alex. Bottle; Messrs. Abraham, Atkins,

Cross, Evans, Hills, Leigh, Southall, and Schacht, and the Editor, Sub-Editor and Secretary.

Pharmaceutical Society of Great Britain (North British Branch).

—Mr. Peter Boa, Mr. D. B. Dott and Mr. J. P. Coats.

Pharmaceutical Society of Ireland.—The Vice-President, Mr. W. F. Wells, Junr., Mr. D. G. Beggs, and Mr. J. C. Payne.

Liverpool Chemists' Association.—Messrs. Abraham, Bain, Conroy, Ward and Wellings.

Brighton Chemists' Association.—Messrs. D. Savage and Marshall Leigh.

Brighton Junior Association of Pharmacy.—Mr. Kilby Pears.

The North of England Association.—The President, the Vice-President, the Secretary and Treasurer.

Aberdeen and North of Scotland.—Mr. James Paterson and Mr. Kay.

Western Chemists' Association (of London).—Messrs. W. Martindale, Arkinstall and J. H. Matthews.

Midland Counties Chemists' Association.—Mr. J. Barclay, Mr. A. Southall, and Mr. Hinds.

Letters of apology were read from various gentlemen unable to be present. Communications had been received from Mr. T. B. Groves (Weymouth), Professor Bentley (London), Mr. W. K. Hopkin (London), Mr. N. H. Martin (Newcastle-on-Tyne), Mr. W. Kirkby (Manchester), Mr. J. B. Stevenson (Edinburgh), Mr. R. Wright (Buxton), Dr. Thresh (Chelmsford), Mr. G. Cross (Shrewsbury), Mr. E. C. C. Stanford (Dalmuir), Mr. R. A. Cripps (Birmingham). An excerpt was read from a letter from Mr. Reynolds (Leeds), in which he made reference to the material growth of Cardiff and the higher education movement. Mr. F. B. Benger (Manchester), an ex-President of the Conference, also wrote to express his regret that he could not be present.

Mr. W. A. H. Naylor (Hon. Sec.) then read the Report of the Executive Committee as follows :—

REPORT OF THE EXECUTIVE COMMITTEE.

During the past year your Committee has met on various occasions to transact the business of the Conference.

The last edition of the Unofficial Formulary having been exhausted, a revised one has recently been issued. In the revision advantage was taken of the opportunity to make such alterations

as circumstances had rendered necessary. With the sanction of the Executive a number of new formulæ have been added, whilst others have been eliminated owing to their adoption by the Medical Council on the recommendation of the Pharmacopœia Committee and their official recognition by publication in the Addendum of the British Pharmacopœia of 1885. Your Committee regards their adoption by the Medical Council as one indication of the usefulness of the formulæ and as an evidence of appreciation of the work done by the Formulary Committee.

The resignation, in December last, by Mr. J. C. Nightingale, of the office of Assistant Secretary, which he had held for the past three and a half years, was received with feelings of regret, and your Committee placed on record an expression of their acknowledgment of the thoroughness with which he had discharged the duties of his post. Mr. M. K. Johnson, Associate of the Pharmaceutical Society, was unanimously chosen and duly appointed to fill the vacancy.

On behalf of the Conference, the Executive presented a congratulatory address to the Pharmaceutical Society of Great Britain on the occasion of its Jubilee, which was celebrated in May of the present year.

Some slight alterations were made in the Blue List prior to its distribution. Members are invited to suggest subjects requiring investigation with a view to their inclusion in the next issue of the List.

The Conference has suffered an irreparable loss by the death of H. B. Brady, LL.D., F.R.S., which occurred at Bournemouth in January last. Mr. Brady was one of the Founders of the Conference, and it was to his conspicuous ability and his untiring zeal in promoting the highest interests of pharmacy that the success of our Association is largely due. He occupied the office of President for two consecutive years—at Brighton in 1872, and at Bradford in 1873. Although during the last few years he was unable to take so active a share as formerly in the business of the Conference, yet his interest in its welfare continued undiminished. The many honours bestowed upon him both in his own country and abroad bespoke the high appreciation in which he was held by the scientific world.

Attention was directed in the last annual report to special efforts that were being made to increase the membership of the Conference. It is a subject for regret that those efforts have failed to realize the degree of success that was anticipated.

No applications for assistance to defray expenses in connection with research have been received during the year. The Committee would again remind members that funds are available for this purpose.

Mr. R. A. Cripps, in conjunction with Mr. Whitby, will present to this meeting a first instalment of their work on ipecacuanha, in aid of which a grant was made some time ago.

The reception held last night by the President and officers of the Conference and the *Conversazione* which followed were, as usual, largely attended, and formed an attractive preliminary to the serious business of the Conference.

In December last, Mr. Louis Siebold, F.I.C., F.C.S., was re-appointed Editor of the *Year-Book*. The MS. of the forthcoming volume, so far as it can be completed, is now in the hands of the printers.

The Treasurer, Mr. R. H. Davies, F.I.C., F.C.S., then read the—

FINANCIAL STATEMENT FOR THE YEAR ENDING JUNE 30TH, 1891.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

1890.	Dr.	£ s. d.	£ s. d.
July 1.	To Assets forward from last year—		
	„ Balance in hand at Bank		83 0 8
	„ Cash in Secretary's hands		3 17 10
	„ Messrs. Churchill's Account		107 3 0
June 30, 1891.			
	To Sale of Year-Book by Publishers		24 6 8
	„ Advertisements, 1890 volume	107 10 4	
	„ „ 1889 „	3 10 6	
			111 0 10
	„ Members' Subscriptions, Amount received for year ending July 1, 1890, to June 30, 1891		476 12 3
	„ Index to Year-Book, sale by Secretary		0 5 0
	„ Outstanding Liabilities, Messrs. McCorquodale and Co.		3 4 6
	„ Unofficial Formulary, sale by Publishers		6 7 1½
			<u>£815 17 10½</u>

1891.	Cr.	£ s. d.	£ s. d.
June 30. By Expenses connected with Year-Book:—			
Printing, Binding, Pub-			
lishing, etc.	293	13 8	
Postages and distribution . .	35	11 0	
Advertising and Publishers'			
Charges	30	0 2	
Editor's Salary	150	0 0	
Foreign Journals for Editor . .	5	15 6	
			515 0 4
„ Unofficial Formulary:—			
Advertising	0	18 6	
Publishers' Commission . . .	0	12 8½	
			1 11 2½
„ Sundry Expenses:—			
Newcastle Portrait Group . .	4	13 3	
Authors' copies of Papers . .	0	10 2	
Expenses of Assist. Sec. at			
Leeds	10	0 0	
Illuminated Address to Phar-			
maceutical Society . . .	1	10 0	
			16 13 5
„ Assist. Sec.'s Salary from July			
1, 1890, to June 30, 1891 . .	45	0 0	
„ Rent of Office	10	0 0	
			55 0 0
„ Blue Lists, Printing.	3	4 6	
Postages	2	19 7	
			6 4 1
„ Postages			10 19 3
„ Printing and Stationery . . .			19 17 0
„ Bank Charges, as per Bank			
Book			0 4 7
„ Petty Cash			4 7 4
„ Liabilities of last year, since			
paid			0 8 6
„ Outstanding Assets—Messrs.			
Churchill's Account			110 3 3
„ Balance at Bank	74	4 9	
„ Balance in Secretary's hands .	*1	4 2	
			75 8 11

* For Postages, £1 3s. 2d.; Petty Cash, 11d. £815 17 10½

The Bell and Hills Fund.

		£	s.	d.	£	s.	d.
1890.							
July 1.	To Balance in hand	17	4	6			
	„ One Year's Dividend on £360						
	Consols	9	13	4			
1890.					26	17	10
Oct. 11.	By Purchase of Books for Leeds	10	5	2			
	Balance				16	12	8
	Assets—						
	Cash—Balance at Bank				16	12	8
	Consols				360	0	0

Audited and found correct { E. YEWDALL, Leeds. }
 { D. ANTHONY, Cardiff. } *Auditors.*

Mr. Davies said there was nothing for him to add to this. The only exceptional items were the portrait of the officers of the Conference taken at Leeds, which was found in the last Year Book, and the address to the Pharmaceutical Society on the occasion of its jubilee. Otherwise the statement was in accordance with that of the preceding year. The amount from members' subscription was not quite so great as in the previous year, being about £40 less. It should not be taken, however, that the membership was actually falling off to a corresponding extent, as sometimes members did not pay their subscriptions every year, but at intervals of two or three years.

Mr. D. Anthony (Cardiff), one of the auditors, stated that he had found the accounts well kept.

It was moved by Mr. Munday, seconded by Professor Redwood, and carried unanimously, that the report and statement of accounts be received and adopted.

The PRESIDENT then delivered the following address:—

THE PRESIDENT'S ADDRESS.

Ladies and Gentlemen,—For a second time in the history of the Conference, we are met in South Wales, in this land of mountains, bards, and song, with its historical reminiscences dwelling in the hearts of its people, who cling to their ancient language and customs with a spirit shown by their annual national festival, or Eisteddfod, held simultaneously with this meeting.

Our former session in Wales was at Swansea, in 1880, under the presidency of my late friend, Mr. William Southall, and in the decade that has elapsed since then, the great centre of industry in which we are now gathered has so largely developed in wealth and importance, that the percentage of its increase in population is double that of any of the other large towns in the kingdom. This shows the great progress that has been made in arts and manufactures by the energy of the Welsh people, aided by the geographical position and mineral wealth of this important district, and the extraordinary facilities that exist for the distribution of its products by sea and land.

It is with great diffidence that I venture to address you, and I feel my incapacity the more in having to follow the many honoured pharmacists who have preceded me in this office, particularly Mr. Umney, who, in his practical addresses at Newcastle and Leeds, dealt in a masterly manner with subjects appertaining to pharmacy from his point of view as a wholesale chemist and manufacturer of pharmaceutical preparations.

May I be allowed, in the first place, to refer to the pharmacist in his relations to the public. As in politics the press is considered the fourth estate of the realm, and perhaps the most powerful, so pharmacy is sometimes regarded as the fourth estate of medicine. It is true that pharmacy is in a position different from that of the press in politics; yet, on account of the assiduous care and attention we have to bestow on our calling, it might be justly claimed that it is far from being the least important section of medicine, especially when we regard the direct bearing it has on the patient. This position is, however, I fear, not always accorded, and we run a risk of having to give place to the nurse, whose calling is now almost assuming the pretensions of a profession.

Who, when passing through the dark valley has not expressed

gratitude to his medical or spiritual adviser, and given thanks for the mother's care, or the fair soft hand of wife, sister, daughter, or even trained nurse, that has smoothed his pillow? But we, as pharmacists, are not brought into such close contact with the patients, as we rarely, if ever, see them while suffering acutely; and notwithstanding our engrossing occupation and poor remuneration, the meed of gratitude we obtain is often the thankless one of having supplied nasty physic.

I will not dwell on the hard times of which we often complain. These are not changed. Shakespeare's apothecary was poor, and although, "being holiday, the beggar's shop" was shut, the *genius loci* was in the interior, as will generally be found on public holidays at the present day.

In our relations with the medical profession I think we meet with more appreciation. In the compilation of the "Additions to the British Pharmacopœia," recently published, the General Medical Council accorded us an acknowledged position, which, in any future revision of our national Pharmacopœia will, I trust, be continued, and even extended.

The tendency of the medical mind is to be conservative as to the use of new drugs, and to know those that are used and their properties well. But opposed to this conservatism is the element of progress in physiological and therapeutical investigation, the search after truth, and the desire for the relief and cure of human and animal suffering arising from disease and pain. There can be no finality to these investigations. As the corporeal substance as well as the mental characters of individuals differ, so do the marked characteristics of well-defined diseases vary. Not only so, but in nature drugs themselves vary, and so much has this been a reproach to our craft that the tendency of pharmacy of late has been to prepare medicines in as definite and as stable a form as possible, and to provide chemical substances whose purity can be tested, where definite medicinal action is required. But, as I have said, the characters of a disease also vary in individuals, and the physician is, therefore, often compelled to treat the patient's symptoms, rather than the disease as a whole.

According to Dr. Lauder Brunton,* pharmacology may be said to have passed through four transition periods in the treatment of disease. "In the first stage, crude drugs were employed, prepared in the roughest manner, such as powdered cinchona or metallic antimony. In the next stage these were converted into

* *Brit. Med. Journ.*, vol. ii., 1886, p. 329.

more active and more manageable forms, such as extracts or solutions, watery or alcoholic. In the third stage, the pure active principles, separated from the crude drugs, were employed, for example, morphine and quinine. In the fourth stage, instead of attempting to extract our medicines from the natural products in which they are contained, we seek to make for ourselves such substances as shall possess the particular action we desire. Now, just as we find stone and iron implements occasionally used together in the same country, so we find that drugs, belonging to the different stages mentioned, are used at the same time. For example, we find crude powders, alcoholic extracts and pure alkaloids, all contained in the same pill. Nay, more, we may sometimes give to the patient, in addition to all these, a medicine made artificially. But while this condition still exists, we notice that crude drugs are being less and less used, and their place is gradually being taken by pure active principles. We may say, then, that we are passing at present from the stone age into the bronze age of pharmacology, and may, indeed, be said to be just entering on the iron age." The last may be called the rational or scientific, as distinct from the empirical, treatment of disease.

Hitherto, the knowledge which we possess of the action of drugs is principally inherited, and most of it has, until recently, been obtained empirically. The search for new remedies was conducted on the basis of their attested reputation. The medicinal properties of opium, cinchona, digitalis, ergot and coca, have been accepted as facts from their empirical history. It is true modern chemistry has, in many cases, isolated definite active principles to which the medicinal properties of these and other drugs are more or less due, yet in this direction much is still left undone. These principles, having to some extent the same properties as the crude drugs from which they have been prepared, have generally been accepted medically as possessing the same therapeutic action. For example, it had long been known that the galenical preparations of coca exercised a soothing influence when applied to irritated conditions of the larynx. Niemann, the discoverer of cocaine, in 1860, Schroff, in 1862, and von Anrep, in 1880, seem to have obtained an inkling of the local anæsthetic action of cocaine. Yet it was left for Koller, after reasoning from the premise that a substance which paralyses the terminal sensory nerves of the mucous membrane of the tongue would probably act similarly on those of the cornea and conjunctiva, to demonstrate by experiment with an aqueous solution of the hydrochlorate of cocaine on the eyes of guinea pigs,

rabbits and dogs, that this alkaloid as a local anæsthetic would be a most valuable addition to the *materia medica*.

The advances made in chemical science during the present century, and the experimental investigations of recent physiologists and therapeutists, tend to prove that the physiological action on the animal system of the simpler chemical compounds, in many cases, is a chemical and physical action of the elements of which they are composed, modified to some extent by what constitutes life; and that the elements themselves act somewhat in accordance with what might be expected from their chemical alliances and the positions they occupy in regard to the periodic law of Mendelejeff. For example, the action of iron and manganese, of arsenic and phosphorus, and of the allied metals of the alkaline earths, calcium, strontium and barium, present striking instances of resemblance in this respect, which are modified by their chemical affinities. Such an action is the strong chemical affinity exercised by oxalic acid for calcium, and its power of withdrawing that element from the circulatory system, as shown by Dr. Ringer.* Calcium being essential to circulation in the animal system, oxalic acid is thus rendered a powerful poison.

Following such investigations, the therapeutist and the pharmacist come between the physiologist, on the one hand, and the chemist and botanist on the other. The former naturally watch the work of the latter with interest. The vegetable kingdom has yielded the principal supply of medicines which have come into use empirically; but, on the other hand, it is to the experimental work of the chemist and physiologist we owe the great advances in inductive therapeutics and pharmacy upon which, latterly, attempts have been made to found the system of rational therapeutics to which I have referred. I have mentioned that the simpler chemical compounds act in accordance with their alliances. In the more complex organic substances there is also a marked connection between physiological action and chemical constitution. The physiological action of a certain compound having been ascertained by experiment, chemists have endeavoured to produce substitution derivatives by replacing certain of its elements or groups by others, thus altering the molecule of the original substance in such a manner as to modify its action at the will of the physiologist, or to satisfy the requirements of the physician. Knowing what the effect of an alteration has been in one substance, they are able to anticipate the results that will be obtained

* *Pract.*, xxxiv., p. 81.

by a similar alteration in other cases, and by inferences drawn from the physiological action of these compounds, to place therapeutics on a scientific basis, being, as Dr. Richardson predicted,* "able to manufacture, in our laboratories, drugs which would produce in the animal body any effect that we might desire, without our having to obtain them, as one might say, haphazard, from various plants or other sources."

Generally the chemist has been in advance of the physiologist, but the latter at times, by a process of induction, has indicated the direction in which he desires the chemist to work. The chemist, it is true, in attempting to formulate the constitution of the alkaloids, has been meeting the physiologist by working along the line of his own investigations, and clearing up the relationship which several of these bodies have one to another. Thus codeine has been shown to be mono-methyl-morphine, whilst caffeine and theobromine are respectively tri- and di-methyl-xanthine, and the connection between these and guanine and urea has been demonstrated, also the relation of cocaine to atropine as well as that of pyridine to piperidine.

Some of the first experiments in this direction were conducted by Drs. Crum Brown and Fraser, the former now President of the Chemical Society, who worked with salts of ethyl and methyl addition products of strychnine and atropine, and obtained results showing that these bodies, although apparently changed little in chemical structure and properties from the original alkaloids, possess physiological actions differing from those of the mother substances in a very marked degree. But the ignorance of chemists with respect to the chemical constitution of alkaloids minimizes at present the value of the results of biological experiments performed with a view of ascertaining the relation between substituting groups and physiological action. The relation of the modified compound to the mother alkaloid may not be understood, and it may be a subject of doubt whether the introduction of an alkyl group into a molecule may result in a simple substitution, or be accompanied by a radical change in the molecular structure. For example, the results obtained by Brown and Fraser led them to the conclusion that the addition of a methyl or ethyl group to strychnine, as in the iodide of methyl strychnium, changes it from a poison which tetanizes the spinal chord into one which paralyses the motor nerves. Stahlschmidt, however, had previously arrived at a different conclusion as to the effect of the introduction of the

* "Brit. Assoc. Reports," 1868, p. 186.

alkyl group, and this apparent conflict in results is expressly mentioned by Brown and Fraser as giving rise to their investigation. But recent investigation has shown that the methyl strychnine used by Stahlschmidt, which he prepared from iodide of methyl strychnium, was not a simple substitution product, but an isomeric compound that readily reverts to methyl strychnium salts under the influence of acids. But in alkaline solution it appears to be more stable, and it has now been found that when methyl strychnine is subcutaneously injected, it produces all the symptoms characteristic of strychnine poisoning.

Up to the present, co-operation between the physiologist and chemist has been most successful when the chemist has started with a body the molecular construction of which was sufficiently well understood. Thus the therapeutic deficiencies of quinoline, which constitutes the nucleus of many natural alkaloids, led to experiments as to the influence on its therapeutic action of certain modifications. By the introduction of a methyl or ethyl group into tetrahydroquinoline, the tertiary bases known as methyl and ethyl kairolin were produced. The employment of an oxyquinoline in place of quinoline was found to yield several more valuable antipyretics, since from ortho-oxyquinoline the methyl and ethyl kairins were prepared, and some time afterwards from para-oxyquinoline were obtained the methyl and ethyl thallins, which are still used to some extent, although the kairolins and kairins have practically been superseded. The connection with antipyrin is not far to seek, for whereas the oxyquinoline derivatives may be prepared by the action of aceto-acetic ether on amidophenol, the pyrazolon derivatives, of which antipyrin is the best known, result from the reaction of aceto-acetic ether with phenylhydrazine.

In fact, it is in the rich field of chemical research opened up originally in the investigation of the constituents of coal tar, which has given such an impetus to the synthesis of organic compounds, that pharmacology has been following chemistry, and sometimes, as I have said, indicating the way in which the more exact science should proceed. It is about thirty-five years ago since Dr. Hoffmann induced Dr. Perkin to undertake a research with a view to building up quinine artificially from derivatives of coal tar. This investigation was unsuccessful, though it resulted in the discovery of mauve, and soon led to the preparation of the various brilliant colours which have dazzled our eyes during the latter part of this century. But although quinine has not yet

been prepared synthetically, other organic substances, as has already been shown, have been synthesized, which have tended to displace that valuable alkaloid from the pinnacle on which it stood twenty years ago. The commercial value of the medicinal substances produced in this way is, indeed, still small compared with that of the dye products; yet even the former are of such importance that one, which I have already mentioned, antipyrin, is in great demand at a price more than three times that of quinine, which it has to a considerable extent displaced, and this notwithstanding also that a much larger dose of it is required. Time would fail me to review all the synthetical products that have been introduced into medical use during the last few years, and as this was so well done by Mr. Hodgkin at our last meeting at Leeds, it is the less necessary now.

The most important of the new remedies obtained from this source may be placed in classes as:—antipyretics, which lessen temperature; analgesics, which relieve pain; hypnotics, which produce sleep; the nitrites, or arterial dilators; antiseptics, or germ-killers; and anæsthetics, which produce unconsciousness or nervous insensibility, and suspend the mental perception of pain. Most of them belong to more than one class, but generally one or other action predominates, and determines the class to which, as Dr. Lauder Brunton says, it may be assigned. These remedies have not been taken haphazard from the innumerable substances known to the chemist, but have been selected from certain groups, the members of which have been ascertained to possess the desired action in varying degrees. Dr. Brunton hopes that we may ere long have a series of remedies having an action upon the heart and vessels like digitalis, strophanthus, sparteine, or erythrophlœum, but possessing an advantage over these drugs in one most important point, viz., in their chemical structure being known to us. It will then be possible to modify them in the laboratory in one way or another until the product is secured which will have the particular effect desired in any given case.

The prognostications as to the effect of these compounds on disease have not, however, always been fulfilled. For example, the use of tetronal in place of sulphonal as a hypnotic has not proved as satisfactory as was anticipated by Baumann and Kast. On the other hand, no reasoning based upon existing knowledge of physiology could have demonstrated that the abstraction of the elements of water from the morphine molecule would convert hydrochlorate of morphine, which is a powerful sedative and

hypnotic, into the hydrochlorate of apomorphine, which produces such prompt emesis. For practical purposes, therefore, the physician is obliged to fall back on the accumulated experience of others for much of his therapeutic treatment.

Having spoken of the scientific and empirical treatments of disease, I pass over other forms of treatment which have attracted more or less attention at times, but do not concern pharmacists, such as hydropathy, galvanism, massage, metallothrapy, faith-curing, and hypnotism or mesmerism, which has more especially been investigated during the last year. But I may, in passing, refer to the medical use of various lymphs, the preparation of which may one day form part of the occupation of the pharmacist. Inoculation with small-pox virus, I am happy to say, is now obsolete, but the beneficent use of vaccine lymph against small-pox, and of Pasteur's cultures for hydrophobia, led Professor Koch to endeavour to destroy the tubercle bacillus with an analogous substance. He attempts this by hypodermic injections, but his fluid, now called "tuberculin"—the exact process of its production has not been published—does not correspond to vaccine lymph. It is stated to be a glycerine extract of pure cultivations of tubercle bacilli. The cultivations are pure in the sense that they are not mixed, as by repeated operations all other microbes are removed from the cultivating medium. The glycerine solution, which according to Koch contains only a fraction of one per cent. of the active principle, is a powerful poison to tuberculous tissue. Recent researches tend, however, to show that the characteristic action of tuberculin is referable to at least three of its constituents, and that the remedial portion, which appears to consist of albumoses, can be separated from the constituents that cause fever and inflammation. According to Koch it is not a direct germicide to the bacillus, but acts by destroying the tissue in which the bacillus is located. Tuberculin would appear to bear the same relation to the tubercle bacillus that alcohol does to the yeast plant, though it is of quite a different chemical nature. We all remember the great sensation it produced about nine months ago. I am sorry it has not proved so successful as was anticipated. Yet, if its preparation be modified and, as I have mentioned, certain principles be removed from it, favourable opinions are still held of its ultimate success, and I am informed, that of the tuberculous diseases phthisis will probably prove the most amenable to its treatment.

Competitors in this line of treatment have not been wanting,

amongst these the use by Liebreich of cantharidate of potassium has been most extolled as a cure for phthisis, but the reports on the use of this also have not been favourable. Other agents destructive of the tubercle bacillus have been suggested for therapeutic use, such as would act on the lung tissue by means of the circulatory system; for example, helenin or alant-camphor, and phenyl-acetic and phenyl-propionic acids. These substances have been found to exert a germicidal effect on the tubercle bacillus under various conditions. In Paris sulphuretted hydrogen, diluted with carbonic acid, administered in the form of enemata, the inhalation of an atmosphere charged with creasote and eucalyptol under pressure, and a ten per cent. solution of chloride of zinc injected deeply into the parts surrounding the tuberculous tissue, have also been used with a similar object, as likewise have injections of the serum of the blood of goats and of dogs, the goat being quite, and the dog to a great extent, immune from attacks of tuberculosis.

But notwithstanding the importance and value of these new weapons for the combating of disease, physicians will probably long continue to use the natural forms of medicine of the third or second groups referred to by Dr. Brunton—that is, the pure active principles, or extracts, or solutions, and the pharmacist will still be in his element in preparing these.

Such medicines have hitherto, as I have said, been principally obtained from the vegetable kingdom; in fact, the empirical search for medicines has probably done more to encourage and stimulate the study of botany than the search for food, or other economic considerations, and a knowledge of this science is absolutely necessary to enable us to supply the various parts of plants used medicinally free from admixture with others. We are bound to use all diligence to supply them in this condition, as well as to exercise our art in preparing them in a suitable and stable condition for administration. Whether medicines be introduced empirically or rationally, pharmaceutical enterprise should not be behindhand, either in commercial supply, in the preparation of galenical compounds, or in the isolation of the active principles of the drugs.

In order to make our galenical preparations more definite, many of them containing recognised active principles have in recent years been officially directed to be standardized. The interesting communications of Messrs. Farr and Wright, read at our last meeting, and others by the same authors which have been pub-

lished since, have shown the necessity of the further use of this mode of obtaining pharmaceutical uniformity, although it may be overdone. The medicinal properties of many of our drugs do not depend on one alkaloid or active principle, but on the blending which has been produced by nature. For example, how could we standardize, with any degree of accuracy, the medicinal action of rhubarb, cascara or senna, or the appetising effect of compound infusion of gentian?

When we turn from physic to food this is still more evident. Nature supplies our food, from both the vegetable and animal kingdoms, of most complex and varied materials. It is true we roughly estimate their richness in nitrogen and carbon; but in health no one thinks of first isolating and then mixing definite quantities of starch, gluten, oil, fat, gelatin, fibrin, casein, and albumen, with water, under any condition, and making a meal of them. The natural flavours would be lost, and appetite would pall before such a *menu*.

The practice of medicine and pharmacy combined, as is frequently the case in this country, is detrimental in many ways, both to those who carry on such practice, and to the public. Originally an apprentice to an apothecary served five years; this was afterwards reduced to one year, the other four being devoted to a compulsory curriculum after registration as a student, before he could present himself for his "pass" examination. Now the Apothecaries' Hall only requires a three months' course of pharmacy and dispensing, and the conjoint board of the Royal Colleges of Physicians and Surgeons requires no stipulated time to be devoted to the subjects of pharmacy and materia medica, or even to chemistry. All that is necessary is that the schedules are signed to the effect that the student has received instruction in the different subjects to the satisfaction of a teacher, who, for pharmacy, may be a member of the Pharmaceutical Society. As there is no examination in practical dispensing, I fear the work is generally done in a very perfunctory manner, and that the knowledge gained of this subject is, in many cases, the minimum.

As it is much more important for a surgeon to know a sharp knife than to know the varieties of iron ore, so a physician ought to be acquainted with the medicinal preparations he prescribes, rather than with the crude drugs from which they are obtained. He should not be like the medical student, who, parrot-like, said of gum arabic, "it is soluble in alcohol and insoluble in water, or the reverse, but I am not sure which."

It is proposed that the compulsory course of medical study be extended to five years; but as these subjects, chemistry, pharmacy, and materia medica may be studied prior to registration as a medical student, I think a course of six months' practice under the eye of a pharmacist would be of great service to the embryo medical practitioner before commencing his hospital career. The courses of chemistry and materia medica might be taken simultaneously, and probably under the same teacher.

If the coming race of medical practitioners receive no practical training in pharmacy they will have no confidence in prescribing, because they will never have known their medicines. They will thus become a prey to the advertising manufacturers of ready-made mixtures and specialties, in place of making use of official or officinal preparations. With the British Pharmacopœia more under the influence of pharmacists, as I expect in future it will be, and our Unofficial Formulary entirely under our own control, I trust in future we may be able to set before prescribers a better array of preparations than they have hitherto had.

If the medical licensing bodies do "throw physic to the dogs" quackery will become more rampant, as the public will have medicines, and have them "elegant" or agreeable to take. Not only so, but the public demands also to have them convenient for use, and in a stable and portable condition. The division of labour tends to perfect the processes of elegant pharmacy. The irresistible fact must be acknowledged, not only in pharmacy, but in all the arts and manufactures, that though the making of preparations in a wholesale manner may in many cases be detrimental to retailers' interests, yet if it be for the public weal the practice will be irrepensible. The age of boluses is past, and the polypharmacy of former times will not go down in the present day.

As suggested by Mr. Umney last year, there would almost appear to be fashions in medicine. As antiseptics for surgical treatment, carbolic acid, boric acid, salicylic acid, eucalyptus oil, iodoform, permanganate of potassium and chloride of zinc have all in turn found favour with surgeons. Now sublimate (perchloride of mercury) is most in favour, but even this fails to prove as germicidal as some experimenters have declared. For producing anæsthesia the conflict has for many years been between chloroform and ether, or mixtures of them with alcohol in addition, or by preceding their use by nitrous oxide. Lately, chloroform, although the most generally used, has fallen into great disfavour, on account of the accidents which have occurred during its use.

I have never witnessed a death from its effects, but it has twice been my painful experience to be interviewed by anæsthetists soon after a death had occurred while they were administering the anæsthetic. There is something awful in the idea of having put a fellow creature to sleep to wake no more. It would appear to be inherent in the nature of these anæsthetics to occasionally produce fatal results. Since its first introduction, chloroform of British manufacture has borne a good reputation; from whatever source it was made, it had an uniform specific gravity and freedom from known impurity. But no reliance on a manufacturer's name can rid us as pharmacists of the personal duty which we owe to the public, and to the anæsthetist in particular, to examine and test the purity of each lot of chloroform and ether we receive into stock, to store it carefully, and to see that it undergoes no change by exposure to light or other causes, especially if it is to be used for anæsthetic purposes.

The purification of chloroform has attracted much attention of late, through the introduction of M. Raoul Pictet's process of crystallizing it at a low temperature and thus obtaining it in a condition represented to be perfectly pure, stable and of specific gravity 1·51—a higher gravity than has hitherto been attainable.

Latterly, a vast number of special preparations and nostrums have been introduced, which, on account of their being advertised and in popular demand, we are obliged to supply; still in regard to these we are not answerable. But, although we cannot breathe a word of praise in their favour, the identical article demanded should be supplied, unless it be to the detriment of the purchaser, in which case we must, in his own interest, advise him. The goods a merchant sells, or a manufacturer makes, represent him; he stamps them with his character; they should be *bona fide* what he professes them to be. As pharmacists, our responsibility is great in regard to these points, as we have to judge such a number of drugs and preparations and test their purity. As to the uses to which our wares and medicines are put when they are medically prescribed in proper doses, we are not accountable; but we cannot rid ourselves of a moral responsibility when we retail them in the ordinary conduct of business.

Dr. Attfield's report to the General Medical Council for 1890, on the revision of the British Pharmacopœia, 1885, has just been presented. It deals principally with the question of synonyms. If the British Pharmacopœia is to be the commercial as well as the pharmaceutical, or rather medical, standard for the prepara-

tions it contains, and the proposed synonyms are tacked on to the official preparations, I fear that notwithstanding Dr. Attfield's reasoning pharmacists will often be placed in greater doubt or difficulty, and even danger, than they are at the present time. For example, if the synonyms of the British Pharmacopœia are to be accepted commercially, then according to it, if asked for arsenic, we must supply white arsenic or arsenious anhydride; to sell it coloured it will be adulterated, yet we are not allowed to sell it otherwise retail. Although I hold to a high standard of purity for medicines, I think that if the official list of synonyms be extended it must be very carefully watched by pharmacists, else as traders they will be placed at a great disadvantage if it be made to include copperas, blue vitriol, white vitriol or spirit of salt. Drysalters would be able to supply these in the crude condition in which they are used in the arts and agriculture, as they would not supply them as "food or drugs;" whereas pharmacists could not rid themselves of the responsibility of supplying them as *drugs*. Dr. Attfield suggests that nitre and saltpetre shall be synonyms of nitrate of potassium. The impurity in commercial nitre is of little importance to its use for domestic and veterinary purposes. Yet nearly all pharmacists use a purer preparation for dispensing prescriptions.

If we are to be liable to penalties under the Food and Drugs Act, for supplying domestic remedies not up to the pharmacopœial standard, which other traders who sell the same are not to be subject to, then I hold we have a right to ask the Legislature to restrict to pharmacists the sale of drugs and preparations defined by the Pharmacopœia.

Most of Dr. Attfield's report is devoted to the vexed "milk of sulphur" question. As he justly says, at the present time two distinct substances are sold under this name. He suggests that in the next revision of the Pharmacopœia "milk of sulphur" shall be a synonym of "precipitated sulphur." Calcareous precipitated sulphur could then only be supplied when the seller knows that the buyer requires this variety; yet it could not be labelled "milk of sulphur," but with a distinctive label, such as "Milk of Sulphur, P.L., 1746." Practically this means the extinction of the sale of calcareous milk of sulphur; and as, so far as I know, milk of sulphur is only used medicinally, although we should lose a relic of ancient pharmacy, yet most pharmacists and the community at large would, I think, part with it without regret.

The everyday routine of dispensing may not develop the common

mind, but to others, who observe and reflect, our avocation affords rare opportunities. The manipulative training which produces the expert pharmacist will develop the expert chemist, and if he has a corresponding mental capacity, the early training with a pharmacist enables such an expert, when fortunate enough to obtain a good chemical training, to become one of the best workers in chemistry. But the combination of the manipulative expert with a mental capacity well trained to the work is rare; such men are sought after, and generally leave our ranks, either for more remunerative or more congenial employment. It would be invidious to mention the names of those who have done so, whether living or dead.

During the past year we have had from the Research Laboratory of the Pharmaceutical Society important papers on pure salicylate of sodium, or rather salicylic acid, demonstrating that the purity of these, when administered internally, should be beyond reproach. From this source also we have had a chemical definition given to the official aconitine, with the promise of further investigations on the aconite alkaloids.

In reviewing the events of the year we cannot overlook those connected with our parent, the Pharmaceutical Society, which has just passed the jubilee of its existence. The cordial greeting it received on this occasion from all quarters showed the general appreciation in which it is held, notwithstanding the difficulties of its position as an educational, examining, and executive corporation. Its Council has endeavoured to promote the interests of pharmacy by attempting to carry through Parliament a Bill which would regulate the course of study before a candidate should come up for his pass examination; but, on account of the block in our legislative machinery, the Bill could not be proceeded with.

A revised syllabus of the examinations of the Society has been issued, and its scope will come into force in October next. This, it is hoped, will better define the course of study for candidates. In an address which I delivered at Sheffield in October last I drew attention more especially to the defects of the Preliminary examination, as a test of knowledge on which to raise a satisfactory superstructure, and suggested that it should be extended to include the rudiments of mathematics and geography, and a knowledge of a modern language, French or German. The subject has since then been much discussed, and there seems to be a widespread feeling of the desirability of such an extension, which is warranted by the facts of the case. An ignoramus is not adapted for our

calling. The public considers us to possess general intelligence, and as our pharmacies have an open door it is not slow to make use of our acquirements. The "schoolmaster is abroad," and we must be prepared to hold our own in the struggle for existence. Practical men find that only the knowledge they make use of is retained, but no bounds can be set to the requirements of the pharmacist in this respect.

In conclusion, it is with regret that I record the death of a past President, its first Treasurer and a Founder of the Conference. In losing Henry Bowman Brady, who for many years "the cross of suffering bore," and folded his "pale hands so meekly" on the 10th of January last, we lose one of the landmarks of pharmacy. Not only was he an accomplished pharmacist, but a man of science, chemist, biologist and microscopist, whom we all delighted to honour. He has remembered his poorer brethren by a beneficent legacy to the Benevolent Fund of the Pharmaceutical Society, and his name will long be held in reverence in Newcastle, where the Conference had its birth.

Mr. SCHACHT moved that the best thanks of the meeting be given to the President for his able and interesting address. He did so with the greatest pleasure. It was to have been expected that an author who had given to the pharmaceutical and medical world such valuable treatises would on this occasion bring before his hearers a scientific purview of the pharmaceutical world, and all would agree that that anticipation had been abundantly fulfilled. At one moment, indeed, he felt a little nervous lest the President should unduly emphasize the importance of the synthetic remedies lately proposed for use in medicine; for belonging, as he did, to a somewhat older school, he sometimes feared that too much attention was turned in that direction. It was not for him, of course, to indicate what should be the practice of medicine in the future; that depended on the studies and investigations of medical men, but he had never been able to divest himself of the thought that man was a very complex creature, his organisation itself being very complex, and an analysis of his organs having not been attempted, and therefore it seemed to him that the application of exact definite positive chemical remedies must be a matter for the future, and probably the instant future, and that for the present they should be content to accept the remedies which nature had provided in a somewhat complex form to meet complex cases. He was very glad, therefore, to find that the President still

admitted that galenical preparations might be of very great value to the practitioner. Every line of the address was worthy of careful study, and he would only refer particularly to one other point in which the President had spoken of the advantages to be gained by both pharmacy and medicine, by their combined study and investigation, a matter in which he cordially agreed.

Emeritus Professor REDWOOD said he had much pleasure in seconding the motion. He could say most honestly that he remembered no previous address which had appeared to him more valuable or more apt and suitable to the period at which it was presented. He had only to add that it would appear to him that pharmacy was now progressing towards the later stages of its development, and it was very obvious therefore that a more efficient system of pharmaceutical education should be pursued in future, one in fact far different from that which obtained some seventy years ago, when he commenced his pharmaceutical studies in Cardiff. He considered himself, therefore, as a Cardiff pharmacist, though the time he spent there with his relative, the late Mr. Vachell, was not very lengthy. His ambition was to study pharmacy where it was carried out on a more extensive scale than was possible in the Cardiff of that day, which only had a population of 4,000 or 5,000, and possessed neither docks nor railways. He therefore made his way to London, where he had spent the remainder of his life. A practical and scientific education had now become absolutely necessary to prepare the pharmacist for his career, and it would be a great gratification to him if in his declining years he could see in Cardiff a good practical and efficient school established for the education of rising pharmacists.

Professor REDWOOD then put the motion, which was carried by acclamation, and shortly acknowledged by the President.

The PRESIDENT then read the following:—

REPORT OF THE UNOFFICIAL FORMULARY COMMITTEE.

A revised edition of the Unofficial Formulary was issued in June, in which the Committee has incorporated the nine formulæ contained in the Addendum of 1889, together with six others, namely, collodion of belladonna, elixir of rhubarb, glycerine of belladonna, ointment of oleate of mercury, and two detannated wines. Seven formulæ have been deleted on account of their

having been accepted by the General Medical Council, and inserted in the official additions to the British Pharmacopœia, 1890. It is hoped that this revision will prove useful to both prescribers and dispensers.

August 17, 1891.

WM. MARTINDALE,

Chairman of the Unofficial Formulary Committee.

The reading of papers was then proceeded with.

In the absence of the authors the substance of the following report was communicated by Mr. Naylor.

REPORT UPON IPECACUANHA.

PART I.—GENERAL PROXIMATE ANALYSIS.

By R. A. CRIPPS, F.I.C., AND A. WHITBY.

The conflicting statements of various observers as to the percentage of emetine in ipecacuanha root, and the comparatively unknown characters of the other constituents, evidence the need which exists for a thorough chemical examination of the drug.

We have therefore undertaken such a research, this communication forming a report upon the first part; the second part is now in progress, but from various causes is not sufficiently advanced to publish at present.

One hundred grams of the root in No. 80 powder were packed in a percolator and exhausted successively by means of petroleum ether, absolute ether, and alcohol of 65 o.p., the powder being exposed to the air to remove adherent solvent between each extraction. The marc was then macerated with cold distilled water, the watery liquid decanted, the treatment with water repeated, and finally the residual root was exhausted with solution of sodic hydrate 0.2 per cent.

By these means five separate solutions were obtained, and examined as follows:—

I. PETROLEUM ETHER SOLUTION.

The solvent was distilled off and the residual fatty extract dried upon the water-bath. It weighed 0.2835 gram = 0.28 per cent. This residue consisted of a fatty oil, which slowly assumed a crystalline appearance, from the presence of numerous nearly white crystals imbedded in a dark yellow thick oil. The residue was

treated with cold absolute alcohol, which dissolved the oily portion, leaving a greyish white insoluble matter which did not wholly redissolve in cold petroleum ether, but left a minute brownish residue, soluble in chloroform. The portion dissolved in absolute alcohol weighed 0.2670 gram, the solution being acid in phenol phthalein, and requiring 5.8 c.c. of decinormal soda solution for neutralization; this is equivalent to 0.1635 gram of free oleic acid, the remaining 0.0135 gram consisted mainly of neutral fat.

That which was insoluble in cold absolute alcohol weighed only 0.0165 gram, and was of a waxy nature.

A portion of the petroleum ether solution was evaporated by aspiration and the residue weighed from time to time; by this means evidence was obtained of the presence of a mere trace of volatile oil.

The petroleum ether, which had been distilled from the extract, was rendered very faintly acid with hydrochloric acid and re-distilled; no residue was left, indicating absence of any volatile alkaloid soluble in petroleum ether.

We may here state that this distillation with a trace of acid was repeated with the distillates from the ethereal and spirituous extracts, in each case with a negative result.

The petroleum ether extract therefore contains—

Volatile Oil	mere trace.
Free fatty acid, equivalent to oleic acid	0.163 per cent.
Neutral fat	0.104 "
Insoluble in alcohol (wax?)	0.016 "
	0.283 "

II. ETHEREAL SOLUTION.

After distilling the solvent the residue was dried and weighed: 0.2795 gram = 0.28 per cent. This dried extract was treated successively with cold distilled water, cold alcohol, and boiling alcohol, whereby it was separated into four portions—

(a) Soluble in water	0.026 gram.
(b) " in alcohol	0.220 "
(c) " in hot alcohol	0.0175 "
(d) Insoluble in hot alcohol	0.0105 "

(a) The solution of water was neutral; gave indications of the presence of a mere trace of alkaloid by Mayer's solution and iodine in iodide of potassium; it contained no sugar, but assumed

a green coloration with ferric chloride; its quantity did not admit of further examination; in all probability it is allied to catechin or quercitrin.

(b) The alcoholic solution left upon evaporation a soft brown residue, which also contained a trace of alkaloid, but consisted mainly of a substance possessing all the properties of an acid resin. It contained no chrysophanic acid or tannin. It was soluble in chloroform. The following reactions were observed—

Dilute KHO —Freely soluble, re-precipitated on addition of HCl .

HNO_3 —Slight action, with yellow coloration.

$\text{HNO}_3 + \text{H}_2\text{SO}_4$ —Slight action, with yellow coloration.

H_2SO_4 —Brownish, becoming purplish brown and finally red-brown when gently warmed on water-bath.

H_2SO_4 and Sugar—Dark brown.

Fe_2Cl_6 —No alteration.

(c) This was not further examined; it was probably wax.

(d) This was found to be insoluble in dilute solution of potassic hydrate; it gave a brown coloration with sulphuric acid. It is probably an indifferent resin.

The ethereal solution therefore contains—

Alkaloid.	Trace.
Substance soluble in water (allied to quercitrin or catechin)	0.026 per cent.
Acid resin	0.220 "
Wax (?)	0.017 "
Indifferent resin	0.011 "
Loss	0.006 "
	<hr/> 0.280

III. ALCOHOLIC SOLUTION.

Total volume 730 c.c.; 10 c.c. evaporated yielded 0.142 gram of dry residue = 10.37 per cent.

One-half of the total spirituous solution was distilled, and the residue evaporated at a low temperature till all spirit was dissipated, then treated with cold distilled water, the solution filtered, the filter washed with water, and the filtrate made up to 100 c.c. In this way were obtained (a) a dark brown solution, and (b) an insoluble brown residue.

(a) Aqueous solution.

(1) *Estimation of Total Solids in Solution.*—5 c.c. on evaporation left a dry residue weighing 0.23 gram = 9.2 per cent.

(2) *Estimation of Tannin*.—25 c.c. were treated with slight excess of plumbic acetate, the precipitate filtered off, rapidly washed, dried and weighed = 0.2135 gram. Upon incineration this yielded 0.1035 gram of oxide of lead, leaving 0.11 gram organic acids, precipitated by lead acetate = 0.88 per cent. tannin, etc.

Twenty-five c.c. similarly treated with cupric acetate yielded no precipitate.

(3) *Estimation of Sugars*.—Sugar was estimated volumetrically by means of Fehling's solution in a portion of the filtrate from the above lead precipitate, both before and after inversion with hydrochloric acid. The results were as follows:—

Before inversion, calculated as	
dextrose	1.76 per cent.
After inversion, calculated as sac-	
charose (additional)	2.12 „
Total.	<u>3.88</u>

(4) *Estimation of Alkaloids, etc.*—25 c.c. were introduced into a separator, rendered slightly acid with H_2SO_4 , and agitated successively with petroleum ether, ether, and chloroform; washed once with petroleum ether, then rendered alkaline by ammoniac hydrate and again agitated with ether and then with chloroform.

One-half of the filtrate from II. was treated in the same manner after removing lead by sulphuretted hydrogen; the separations in this case were far more rapid and the residues purer. In this way four residues were obtained from the evaporated solvents, petroleum ether extracting nothing. The quantities obtained were so small that the remaining portion of the original alcoholic extract (355 c.c. = 48.6 grams) was distilled, the extract diluted with water, precipitated by plumbic acetate, and filtered, the filtrate treated with sulphuretted hydrogen, again filtered and agitated with solvents as above.

*a*¹. *Extracted by Ether from Acid Solution*.—Upon evaporation this yielded 0.012 gram of dry extract = 0.0246 per cent.

This extract was of a yellowish colour, almost insoluble in water, but soluble in alcohol, chloroform, or dilute alkaline liquids; from the latter it is re-precipitated upon addition of acids. When boiled with dilute hydrochloric acid it yields no glucose. Water or dilute acids extract from it traces of an alkaloid as indicated by iodine or Mayer's solution. The acid ethereal extract therefore consists of an acid resin with traces of an alkaloid.

*b*¹. *Extracted by Chloroform from Acid Solution*.—This ex-

tract was of a brown colour, and when dry weighed $0.0485 = 0.10$ per cent. By treatment with warm water it was resolved into two parts, soluble and insoluble, weighing respectively 0.037 gram and 0.0115 gram $= 0.076$ and 0.023 per cent.

The solution in warm water became opalescent on cooling, it possessed a somewhat bitter and nauseous taste; it gave no indication of glucose with Fehling's solution, but after digesting upon the water-bath with weak hydrochloric acid for an hour glucose was produced, indicating the presence of a glucoside. With alkaloidal reagents the following reactions were observed:

Mayer's solution	Yellowish white precipitate.
Iodine in iodide of potassium	Orange-brown precipitate.
Potassio-bismuth iodide	Orange precipitate.
Phospho-tungstic acid	Pale yellow precipitate.
Platinic chloride	Yellow precipitate, insoluble when warmed, but soluble in alcohol.
Auric chloride	Yellow, not dissolved upon warming, sparingly soluble in alcohol.
Potassic hydrate	Slightly darkens solution, rendering it quite clear.
Ferric chloride	Greenish coloration.
Acetic acid and calcium hypochlorite	Coloration more orange, indicating trace of emetine (?).
Baric hydrate	No precipitate.

The dried residue from aqueous solution reacted as follows:—

Sulphuric acid	Pale dull brown, gradually darkening.
Sulphuric acid with sugar	Pale dull brown, gradually darkening.
Sulphuric acid and molybdate	Orange-brown becoming greenish brown.
Sulphuric acid followed by HCl	Evanescent indigo coloration.
Nitric acid	Orange.

That portion insoluble in warm water was readily soluble in spirit, and partially soluble in water acidulated with sulphuric acid. The weak acid solution gave evidence of the presence of an alkaloid the reactions of which were the same as those given above. It was also soluble in dilute aqueous alkalies, from which acids precipitated a small quantity of resinous substance. It is evidently a mixture of an alkaloid with an acid resin. The reactions of these substances indicate an alkaloid which if not emetine is nearly allied to it, with an acid resin, and a glucoside slightly soluble in water. The absence of a precipitate with baric

hydrate shows that the glucoside is not saponin, although this aqueous solution froths considerably when agitated.

c¹. Extracted by Ether from Alkaline Solution.—After eight separations it was found that ether still removed *traces* of alkaloid, the quantity removed by the last two not appreciably differing, although the first three separations removed abundance of alkaloid. This is in accordance with our observations when working upon ipecacuanha for assay purposes. The eight washings were washed with water, allowed to evaporate spontaneously, and the residue finally dried over sulphuric acid. It weighed 0.9275 gram = 1.91 per cent. This alkaloidal residue was of a very pale yellow-brown colour, and presented a semi-crystalline appearance in the thinner films. It was rapidly and completely soluble in weak hydrochloric acid, rectified spirit, alcohol, or ether; in the latter solution, petroleum ether produced a perfectly white precipitate.

The dry alkaloid gave the following reactions—

Sulphuric acid . . .	Very pale yellow, becoming very pale brown when warmed upon water-bath.
Sulphuric acid and sugar . .	Faint pinkish brown, becoming salmon-pink.
Nitric acid . . .	Pale orange-brown, becoming bright orange-red.
Hydrochloric acid . . .	No coloration.
Fröhde's reagent . . .	Pale yellowish pink, becoming greenish.
Fröhde's reagent and H Cl .	Greenish blue, becoming rose with green at edges.

The dilute H Cl solution reacted as follows :—

Potassic hydrate . . .	Abundant white precipitate, insoluble in excess.
Ammonic hydrate . . .	Abundant white precipitate, insoluble in excess.
Chlorinated lime . . .	Orange solution then yellow precipitate.
Auric chloride . . .	Yellow precipitate, soluble on warming.
Platinic chloride . . .	Pale yellow precipitate, soluble in spirit.
Mayer's solution . . .	White precipitate.
Sonnenschein's solution . .	Yellow precipitate.
Potass. bismuthic iodide . .	Brilliant orange-red precipitate.
Potass. cadmic iodide . . .	White precipitate.
Iodine in potassic iodide . .	Bright brown precipitate.
Phospho-tungstic acid . . .	White precipitate.

These are the general reactions ascribed to emetine, but the almost complete absence of colour with sulphuric acid and Fröhde's reagent, with the clearer and more distinct colours with sulphuric acid and sugar and nitric acid, would suggest a greater degree of purity than is usual.

Further experiments upon this alkaloid are reserved for the second part of this report.

d¹. Extracted by Chloroform from Alkaline Solution.—After separation of the ether the aqueous liquid was agitated with four successive quantities of chloroform; the last washing was found to contain only a mere trace of alkaloid. These chloroformic solutions were washed with water, and being still highly coloured, the alkaloid was extracted therefrom by two agitations with dilute sulphuric acid. The acid removed all the colour, which was, however, again transferred to chloroform when agitated with that liquid after addition of excess of ammoniac hydrate. It was thus seen to be impossible to further purify this alkaloid by agitation, and therefore the chloroform solution was evaporated and dried at a low temperature. It weighed 0.1175 gram = 0.242 per cent.

This residue presented distinct indications of crystalline character; it was of a dark brown colour, and in solution was slightly fluorescent. The dry alkaloidal residue was tested with the usual reagents, giving the same results as the alkaloid extracted by ether, with these exceptions.

Sulphuric acid . . .	No coloration.
Fröhde's reagent . . .	No coloration, pale bluish on addition of HCl.
Sulphuric acid and sugar .	Gradually yellow, then brown.
Nitric acid . . .	Gradually yellow, then fading.
Auric chloride . . .	Dirty yellow, soluble on warming.
Phospho-tungstic acid .	Dirty white.
Potass. cadmic iodide .	Dirty white.
Potass. or ammoniac hydrate.	Scarcely any precipitate.
Chlorinated lime . . .	Pale orange yellow.

These reactions indicate a certain admixture with the last described alkaloid, but accompanied by some other substance, most probably also alkaloidal.

e¹. The aqueous liquid from which the above-named solvents had been removed was rendered faintly acid by means of sulphuric acid, then an excess of magnesia added, and the whole evaporated to dryness in the water-bath, and the dry residue powdered. The powder was boiled successively with ether, chloroform and alcohol.

Each of these solvents extracted a small quantity of solid matter. The amount from ether and chloroform was very small, and appeared to consist mainly of resinous substances; alcohol extracted 5.01 per cent.; this would include the sugars, therefore the substance other than sugar would amount to 1.13 per cent. It consisted of colouring matter and probably other indefinite substances.

(b) *Insoluble brown residue*.—This was treated with dilute ammoniac hydrate, whereby a large proportion was dissolved; this solution upon treatment with slight excess of acetic acid, evaporation to small bulk, and filtration, yielded a precipitate which, when washed and dried, weighed 0.169 gram = 0.338 per cent. phlobaphane. The residue insoluble in ammonia was digested with rectified spirit which dissolved 0.11 gram = 0.22 per cent. This portion was insoluble in aqueous potassic hydrate, and may be regarded as an indifferent resin. That which was insoluble in rectified spirit was not further examined.

The alcoholic solution was therefore found to contain:

	Per cent.
Tannin and allied bodies	0.88
Saccharose	2.12
Dextrose	1.76
Resin removed by ether from acid solution	0.025
Resin and alkaloid removed by chloroform from acid solution	0.100
Alkaloid removed by ether from alkaline solution	1.910
Alkaloid removed by chloroform from alkaline solution	0.24
Resinous body not removed by agitation .	0.07
Colouring matter, etc., soluble in water .	1.13
Phlobaphane	0.34
Indifferent resin	0.22
Colouring matter, etc., insoluble in water .	0.61
Loss	0.965
Total extract .	10.370

IV. THE AQUEOUS SOLUTION.

Made up to 1 litre.

(1) *Estimation of Total Extract*.—25 c.c. yielded 0.3815 gram of residue dried at 100° C. = 15.26 per cent.

(2) *Estimation of Mineral Matter*.—The above residue left upon incineration 0.032 gram of ash = 1.3 per cent.

(3) *Estimation of Mucilage*.—25 c.c. treated with 50 c.c. absolute alcohol in closed flask, allowed to stand twenty-four hours, collected on a tared filter, washed with 66 per cent. alcohol, dried and weighed = 0.1690 gram; when ignited this precipitate yielded 0.004 gram of ash. The mucilage so obtained contained much albumen. Mucilage + albumen = 6.61 per cent.

100 c.c. treated for albumen as described further on yielded 0.28 gram = 2.8 per cent. $6.61 - 2.8 = 3.81$ per cent. mucilage.

(4) *Estimation of Dextrine*.—The filtrate from mucilage was evaporated to a low bulk and mixed with four volumes of absolute alcohol and rapidly filtered off. After washing and drying it weighed 0.052 gram = 2.08 per cent.

(5) *Estimation of Sugar*.—The filtrate from dextrine was assayed for sugar by Fehling's solution, and yielded 2.30 per cent.

(6) *Estimation of Organic Acids*.—After removing mucilage from 25 c.c. and evaporating off the alcohol, plumbic acetate was added in slight excess, allowed to stand two days, filtered, and the precipitate washed, dried and weighed = 0.123 gram. Upon ignition it yielded 0.084 gram, the difference 0.037 gram being organic acids and allied substances = 1.48 per cent.

(7) *Estimation of Albumens*.—For the more accurate estimation of albumen, 10 grams of root were treated with cold water (100 c.c.) and filtered.

To 25 c.c. of the filtrate 5 c.c. of a saturated solution of salt were added, together with a few drops of acetic acid, and the whole raised to the boiling point. The precipitate which formed was collected upon an asbestos filter, washed with hot water, then with 40 per cent spirit, dried and weighed; the asbestos and albumen were then ignited and again weighed, the difference 0.0775 gram represents albumen precipitated by boiling = 3.10 per cent.

To another 25 c.c. of this solution, mixed with half its volume of a saturated solution of salt, a solution of tannin and acetic acid in dilute spirit was added, rapidly filtered under pressure, washed with water and dried. The precipitate was boiled with alcohol to remove tannin and the insoluble residue weighed = 0.0884 gram = total albumen 3.34 per cent.

The addition of hydrochloric acid to the aqueous solution in the cold produced only a faint cloudiness upon standing, indicating absence of more than a mere trace of legumin and allied substances.

(8) *Estimation of Alkaloid*.—100 c.c. of the aqueous extract were rendered alkaline by ammonia and agitated with chloroform.

The separation was troublesome, and the chloroform residue weighed 0·0056 gram = 0·056 per cent. Another proportion was treated with Mayer's solution, the precipitate dissolved by ether, the ethereal solution mixed with alcohol and water and decomposed by sulphuretted hydrogen, filtered from mercuric sulphide, treated with ammonia in excess and again agitated with ether. By this means a dark coloured alkaloid was obtained, representing 0·166 of the root.

The following reactions were observed with this alkaloid :—

Sulphuric acid . . .	Reddish-brown, not changed on water-bath.
Nitric acid, 1·42 . . .	Brick-red.
Nitric and sulphuric acids .	Brownish-red.
Fröhde's reagent . . .	Brownish-purple, becoming browner.
Fröhde's reagent and hydrochloric acid . . .	No blue coloration.
Hydrochloric acid . . .	Reddish brown.
Chlor. lime and acid . . .	Faint emetine reaction.
Platinic chloride . . .	Yellow precipitate, soluble in spirit.
Auric chloride . . .	Yellow precip., insoluble on warming.
Mayer's solution . . .	Yellow precipitate.
Sonnenschein's reagent . .	Dirty yellow precipitate.

The aqueous solution was therefore found to contain :—

	Per cent.
Mineral matter	1·30
Mucilage	3·81
Dextrine	2·08
Sugar	2·30
Organic acids and allied bodies . . .	1·48
Albumen precipitated by boiling . .	3·10
Albumen not precipitated by boiling .	0·24
Alkaloid	0·166
Colouring matter and loss	0·784

Total solids . . . 15·260

V. ALKALINE SOLUTION.

2 litres 50 c.c. were acidified by the addition of acetic acid, mixed with 3 vols. of alcohol of 90 per cent., and allowed to stand twenty-four hours. The precipitate was collected on a tared filter, washed with 75 per cent. alcohol, dried, weighed, and ash deducted. This corresponds to pectin and albuminoids 0·0835 gram = 3·34 per cent.

The filtrate and washings from pectin, etc., were evaporated to dryness, and the amount of sodic acetate deducted. The residue weighed 0.078 grams = 3.12 per cent.

This solution yielded a larger amount of ash than would be accounted for by the acetate of sodium present, the difference representing 0.80 per cent. of the root.

The alkaline solution contains:—

	Per cent.
Pectin, albumen, etc., precipitated by alcohol	3.34
Albuminoids, etc., not precipitated by alcohol	3.12
Ash	0.80
	<hr/> 7.26

VI. ESTIMATION OF STARCH, ETC.

The residue of the 10 grams used to estimate albumen was introduced into a flask together with 100 c.c. of 1 per cent. hydrochloric acid, the whole boiled for four hours, using a return condenser. The liquid was then filtered and the insoluble portion thoroughly washed, the filtrate being made up to 1 litre with distilled water, after being neutralized with sodic bicarbonate. The sugar in the solution was then estimated as usual, 10 c.c. of Fehling's solution requiring 10.125 c.c. of the liquid (mean of several estimations) = starch 44.44 per cent.

VII. CELLULOSE, FIBRE, ETC.

The residue from 6 was dried and weighed 1.13 gram = 11.30 per cent.

VIII. MOISTURE, ASH, ETC.

4.774 gram of original powder when dried at 100° C. lost 0.518 gram = 10.85 per cent. moisture. Upon ignition 0.116 gram of ash was obtained = 2.43 per cent. This ash was treated first with distilled water, then with hydrochloric acid, whereby were obtained the following:—

	Per cent.
Soluble in water	0.524
Soluble in hydrochloric acid	1.696
Insoluble in hydrochloric acid	0.210

The portion soluble in water consisted mainly of potassic sulphate, with a trace of sodic chloride.

That soluble in hydrochloric acid contained calcic and magnesian phosphates, calcic carbonate and ferric oxide.

The insoluble portion consisted of silica.

IX. SUMMARY.

The following table expresses the results of this examination of a sample of ipecacuanha root.

	Per cent.
Moisture	10.85
Volatile oil	Trace
Free fatty acid	0.16
Neutral fat	0.11
Wax (?)	0.03
Acid resins soluble in ether	0.25
Indifferent resins	0.23
Substance allied to quercitrin	0.03
Tannin (total)	1.13
Phlobaphane	0.34
Saccharose	2.12
Dextrose (total)	4.06
Dextrine	2.08
Mucilage	3.81
Albumen precipitated by boiling	3.10
Albumen not precipitated by boiling	0.23
Albumen, pectin, etc., insoluble in OH_2	3.34
Albumen not precipitated by alcohol	3.12
Organic acids and allied bodies	1.48
Alkaloid removed by ether from alcoholic extract	1.91
Alkaloid removed by chloroform	0.24
Alkaloid, etc., removed by chloroform from acid solution	0.10
Alkaloid from aqueous extract	0.17
Colouring matter and decomposition products	2.52
Resinous (?) matter not removed by agitation with ether, etc.	0.07
Starch	44.44
Cellulose, lignin, etc.	11.30
Ash, soluble in OH_2	0.53
Ash, soluble in HCl	1.69
Ash, insoluble in HCl	0.21
	<hr/>
	99.65

In conclusion I wish to state that this examination has been carried on in the laboratory of Messrs. Southall Bros. and Barclay,

to whom my thanks are due; also to thank the Committee of this Conference for a grant from the Research Fund towards the expenses.

The discussion on this paper was taken with that on a paper entitled—

PREPARATIONS OF IPECACUANHA.

By W. H. SYMONS.

Observing that a paper is to be read at this year's meeting of the Conference on the subject of ipecacuanha, I think it may be interesting to place before you certain samples of preparations which, with the view of ascertaining how they keep their virtue, I made some five years ago.

Concerning the ipecacuanha used I have the following notes. It lost 12·8 per cent. of its weight on drying in a water oven. Treated as described in the Pharmacopœia, 3 ozs. yielded 265 grains of dry acetic extract, or nearly 90 grains per ounce: this extract with certain precautions could be powdered, but it was very hygroscopic.

Made into a paste with lime, ammonia and water, and allowed to stand twenty-four hours, then dried at a low temperature and percolated with boiling chloroform to exhaustion, 45 grains of this acetic extract yielded 1·98 grains of a substance which had the characters of impure emetine.

Some of the above-mentioned acetic extract was made into the official wine by dissolving in Gilbey's Castle G sherry. Another portion was similarly treated with sherry which had been mixed with gelatine and subsequently filtered. From the same ipecacuanha I made vinum ipecacuanhæ B.P. 1867, acetum ipecacuanhæ Y.B. 1872, a tincture with proof spirit and another with weak spirit containing about 10 per cent. alcohol, also an ammoniated tincture by moistening 1 ounce of ipecacuanha with 1 drachm of solution of ammonia (10 per cent.) and then slowly percolating to 20 ounces with weak spirit (10 per cent.).

None of the samples have been filtered since they were first made, they have been taken as fairly as possible from the bulk, the bottles being well shaken just before sampling. At no time has any precipitate been discernible in the ammoniated preparation, and it is to this preparation that I wish particularly to draw your

attention, for it is the only one which has stood the test of time, it still contains a large proportion of emetine.

As far as my experiments have gone it would appear that a menstruum containing about 1 grain of free ammonia per ounce furnishes the best preparation of ipecacuanha. I hope in the course of a few weeks to be able to estimate the alkaloidal value of the preparations I now show, and to try how far an ammoniated wine will fulfil the conditions necessary to make the preparations of this important remedy more reliable than they have hitherto been.

The PRESIDENT said the samples sent by Mr. Symons quite verified the statements made by him that ammoniated wine was perfectly clear, while the others had become somewhat muddy. The paper by Messrs. Cripps and Whitby was only a first instalment, the alkaloids not having been analysed, though two had been observed, one soluble in ether and the other soluble in ether but insoluble in chloroform.

Mr. NAYLOR was glad to see that the authors had noticed the presence of free fatty acid in ipecacuanha root. As far as he knew this fact was not mentioned in any text-book, though it was no doubt known to many. If these gentlemen were inclined to investigate the constitution of this fatty acid further he could furnish them with a quantity of the crude material. It was also interesting to note the percentage of emetine obtained from the root. Some years ago very large percentages were reported, but more recently it had been suggested by Flückiger and others that those percentages were exaggerated. The present figures seemed to approach very nearly to 2 per cent., instead of the $1\frac{1}{4}$ per cent. at which they stood five or six years ago.

Mr. DOTT said he had been struck by the very high proportion of starch, which was probably due to the method of estimation employed, under which other carbohydrates would be included as starch. With regard to the second paper he thought it unadvisable to advertise particular wines. He did not think an ammoniacal preparation could be held to correspond with the present ipecacuanha wine, however desirable it might be in other respects.

Mr. RANSOM asked what was the percentage of emetine found by the authors.

The PRESIDENT said the amount of alkaloid soluble in ether was given as 1.91.

Mr. RANSOM added that over an experience of some years he had found on average of from $1\frac{1}{2}$ to 2 per cent. of so-called emetine, which was, however, probably a mixture of alkaloids, and he was glad to find that this had been confirmed. Much higher percentages had been found, whilst Flückiger on the other hand said ipecacuanha rarely contained more than 1 per cent. He was interested in the suggestion for introducing an ammoniacal wine. No doubt the alkaloid was easily extracted by the addition of a little ammonia to the menstruum, and probably ammoniated ipecacuanha wine would be found a valuable preparation.

The PRESIDENT remarked that the authors had reserved the thorough examination of the alkaloids for the present; they did not assert that it was all emetine. The amount of starch appeared somewhat large, but it was well known that some samples of root were much more starchy than others.

Mr. COLLIER said ipecacuanha was largely used at Guy's Hospital in the treatment of anthrax. There were a number of tanneries in the neighbourhood, and cases were often brought in in which infection had taken place from skins, and ipecacuanha had been found very useful, both administered internally and as an outward application after the removal of the pustule. A number of experiments were conducted by Dr. Washbourne in the biological laboratory, and he found that ipecacuanha undoubtedly had the power of checking the growth of anthrax bacillus; but a solution of emetine was found perfectly ineffective for this purpose. He (Mr. Collier) had suggested that it might be due to the aromatic oils, but the analysis now given showed such a small percentage of these matters that it could hardly be so. It had been shown before that the emetine was of no value in dysentery, but, on the contrary, ipecacuanha deprived of its emetine was more valuable on account of not producing sickness, whilst it was equally powerful in checking dysentery. What the active principle against anthrax was he did not know at all, and hoped the authors would have thrown some light upon it. The subject was very interesting and important, and was dealt with at some length in the Guy's Hospital Reports for the present year.

Mr. J. C. UMNEY was surprised that no reference was made in the abstract given of the paper to the volatile alkaloid, which had been stated by Arndt to exist to the extent of about 0.3 per cent. He should like to know if the statement had been confirmed or refuted.

Mr. HAGON suggested that if the ammoniated preparation of

ipecacuanha was as nasty as ammoniated tincture of quinine it would be objectionable, especially for children.

The PRESIDENT said ipecacuanha was often administered in combination with ammonia, especially in bronchitis, and the combination would probably often be found serviceable. Whether it should be a wine or tincture might, however, be a question.

Mr. WILLIAMS said the combination mentioned in the paper was an ammoniated tincture; it was a tincture of 10 per cent. strength in alcohol, with only 3 minims liquor ammoniæ to the ounce, or about 1 grain real ammonia, a quantity so small as to be scarcely perceptible, and to him its preservative effect was very remarkable.

Mr. GERRARD said there were many drugs, both in the Pharmacopœia and outside it, the active principles of which could be readily extracted by the addition of a small quantity of alkali. This was the case to some extent with ergot, and he had found it to hold good when extracting alkaloids. Many of them were united with tannin-like acids which were very insoluble, but ammonia acted on the tannin and rendered the bases soluble in water, spirit, or almost any solvent. The suggestion made, therefore, was both practical and useful. In the majority of prescriptions containing ipecacuanha which came into his hands it was combined with ammonia, though occasionally with an acid, such as oxymel of squill. He hoped the author would go on and prepare a formula for the ammoniated preparation.

Mr. MOSS said he had noted one or two points in the paper which had been already commented on by other speakers. One particularly was the large percentage of starch, which had never been recognised in such quantities before. To estimate a body like starch by the process described was sure to give results very much above the actual proportions present in the root. Such bodies as glucosides would yield the same product, sugar, and would therefore be reckoned as starch. He had also been struck by the small amount of pectic acid obtained. Anyone who worked with this root, especially in making the official extract, would notice the tremendous separation of pectic acid soon after the first percolate was heated; so much so that one was inclined to think that the figures for pectic acid and starch might be transposed. Of course, pectic acid took up a large amount of water, so that the quantity might be correct; but one would think that pectin must be present in larger quantity than had been mentioned. The paper represented a vast amount of work, and reflected great credit on the industry and painstaking of the authors.

Mr. STROTHER suggested that the Conference might find the means to supply investigators with similar samples of the root, so that the work might be identical. Samples of ipecacuanha differed so enormously that frequently a difference of a few grains would be observed in two experiments, when if the same sample had been worked upon the result would have been identical. It was remarkable that some persons were extremely susceptible to ipecacuanha. He had heard of a gentleman who could not remain in a place where ipecacuanha had been powdered twenty-four hours previously.

The PRESIDENT, in proposing a vote of thanks to the authors, said there was no doubt the presence of a volatile alkaloid increased the difficulty of the investigation. Some people were extremely susceptible to it, but they were rare cases.

The next paper read was—

A NOTE ON EXTRACTUM EUONYMI SICCUM.

BY MICHAEL CONROY, F.C.S.

By the instructions contained in the addendum to the British Pharmacopœia we are directed to make this article by exhausting the root bark of *Euonymus atropurpurens* with a menstruum composed of equal parts of rectified spirit (sp. gr. 838) and water. The spirit is then distilled off and so much sugar of milk added to the still fluid extract—the actual amount having been ascertained experimentally—that the final product shall contain 80 per cent. of dry extractive. The mixture is then evaporated over a water-bath until it becomes brittle. “The mass may then be powdered and kept in a well corked bottle.”

The last sentence is copied verbatim from the directions, and it is in reference to it that this note is concerned. Whatever success may be obtained experimentally in making this article in a small way I am unable to say, but it is certain that the process is not suitable for making it in quantity. The method is right enough until we come to the powdering of the dried extract, but this is a serious matter indeed to the unfortunate individual who has it to perform. The extract is so extremely hygroscopic that the operation has to be performed in a warm, dry room, and even then it is with the greatest difficulty that it can be obtained in a pulverulent form. But success in this is not of much value, as the powder

soon coheres and forms quite a mass again, even in well-stoppered bottles.

I have tried in two ways to remedy this defect, each of which is an improvement. In the first one the extract was dried on the water-bath without the sugar of milk, which was added, in the right proportion, during the operation of powdering instead. This was a great improvement, inasmuch as the extract dried better and powdered much more easily. The gradual addition of the sugar of milk during the operation of powdering prevented adhesion of the extract against the mortar, and gave greater freedom to the pestle. The resulting powder was paler in colour and kept very well in stoppered bottles.

The other plan consisted in adding calcined magnesia instead of sugar of milk to the *soft* extract, and in other respects following the official process. This plan in every way proved a success. The extract dried rapidly, and practically lost all its troublesome hygroscopic properties. The operation of powdering was performed easily under ordinary atmospheric conditions without any special precautions, and the pulverized extract remained a perfectly mobile powder.

Light calcined magnesia was used in the operation, but probably the heavy kind would also answer. The light kind was chosen on account of its greater bulk. As the improvement in the preparation is a mechanical one, due to the fact that the particles of magnesia envelope the powdered extract, and thus protect it from atmospheric influences, it appeared to me that the light kind would go farther in this respect.

Samples of the official kind and the two others referred to in this note are on the table for inspection.

Mr. DOTT said he had had the same experience as the author, having found the tendency in the powder to adhere a great inconvenience. The only objection he had to such a substance as magnesia was that it would represent a considerable proportion of insoluble matter. If a preparation could be produced which would remain in a dry and powdered form without that addition of insoluble matter it would be preferable.

Mr. MOSS said his experience was somewhat different from Mr. Conroy's, for what he had made corresponded exactly with the Pharmacopœia characters. It was true it was hygroscopic and required to be kept in a very well-corked bottle, and if any of it

got left round the neck of the bottle it became resinous, melted, and formed a sort of varnish; but the bulk of the contents remained perfectly separate, even when kept for some months. Mr. Conroy did not say how soon the powder acquired this coherent condition. One would expect that powders like magnesia, or phosphate of lime, would act as he had said, but the question was whether such additions were not travelling somewhat in the direction of those makers of euonymin who had been rebuked by English pharmacists. It had been said that sulphate of barium had been found in some American preparations, and this was regarded as an adulteration; but it seemed to him that there were not many steps between magnesia or phosphate of lime and sulphate of barium.

Mr. J. C. UMNEY said he had made two or three quantities of this preparation on a fairly large scale, using 100 lbs. each time. On two occasions he had found no difficulty in powdering the extract according to the Pharmacopœial directions, but on the third occasion there was a difficulty, and though it was reduced to powder, after a time it became so agglomerated that the bottles had to be broken to take it out.

Mr. GROSE said he was not a maker of this preparation, but a user of it, and he must admit that its condition sometimes called forth a good many adjectives which were not to be found in Johnson.

The PRESIDENT said his experience, which was only in a small way, agreed with what had been stated by Mr. Moss and Mr. Umney, that the preparation could be made according to the Pharmacopœia directions. It was quite probable, however, that some samples of the root bark would not yield a preparation which would with only 20 per cent. of sugar of milk produce a powder that would keep well. The matter was a good deal discussed in the committee, and sugar of milk was selected as being the most inert and therefore least objectionable excipient which could be used. The powdered root bark itself was suggested, but that was discarded in favour of sugar of milk, which was deemed the most acceptable excipient. He might add that the wording of the directions was very carefully guarded. It said, "The mass may then be powdered and kept in a well-corked bottle;" it was foreseen that, especially if sent to warm climates, there would be this tendency to agglomerate into a hard mass.

Mr. NAYLOR said there seemed to be an impression on the part of those who had spoken that the hygroscopic principle was the

oil present in the *extractum euonymi siccum*, but he did not think that was the case. The chief hygroscopic principle was the extractive matter, which was soluble in alcohol, water, and other solvents. So far as he knew, having tried the preparation on himself, and taken the extractive matter, it was practically of no advantage unless it produced a tonic effect. He must confess to a certain degree of regret in respect of the process introduced into the *Pharmacopœia* for making euonymin, and still considered the selective method by far the best, since from the article made in that way the best results had been obtained. Indeed, but for those results it might be questioned whether they would have had this particular preparation in the *Pharmacopœia*. It had come to be recognised in this country because euonymins made by the selective method were found to have a distinct action on the liver. Now the official preparation had but a mild action on the liver. It might be that a mild action was required, and in time the *Pharmacopœia* preparation might come into use, but at present all those who had to do with the manufacture of euonymin on a large scale would agree with him that the sale of it was comparatively small. He regretted that a method was not selected which had for its object the extraction of the cholagogic principles and the elimination of those substances from the product which they knew to be of very little, if of any, medicinal value.

Mr. DOTT doubted whether it was known with certainty what preparations were used by Professor Rutherford in his experiments.

Mr. NAYLOR said at any rate they must have been preparations which were then in the market, and there were none then, so far as he knew, which in any way corresponded to this particular preparation of the *Pharmacopœia*. If those were tested they would be found to contain principally the resins, which if taken alone would be found to produce most powerful effects. He had tried them on his own system for some time, and when undiluted they produced pronouncedly griping and purgative effects. They could readily be reduced to powder with sugar of milk. Mr. Moss had alluded to the fact that the Americans made use of other diluents, but notwithstanding that the preparation was extremely active.

The PRESIDENT said there was intense bitterness in the aqueous extract, quite distinct from the resinous principle.

Mr. NAYLOR said there was no bitterness in the resin.

Mr. CONROY, in reply, said the main objection was that raised

by Mr. Moss, who suggested that because American makers had used carbonate of barium in this article, which was most objectionable, we should be approaching that practice by using magnesia. He (Mr. Conroy) considered there was a wide gulf between using a poisonous substance like carbonate of barium and a perfectly harmless one like calcined magnesia. Mr. Moss said the powder did not aggregate when kept in well closed bottles. That was so, but if the bottle was opened from time to time for use it would soon aggregate. The only real objection was the one pointed out by Mr. Dott, namely, the addition of an insoluble substance to the extract. But then the presence of 10 per cent. of a harmless substance like magnesia could not be very objectionable when it gave them an article that could be handled with ease and comfort, and one that would keep well.

The PRESIDENT then moved a vote of thanks to Mr. Conroy, which was unanimously agreed to.

The next paper read, which was by Dr. Rideal, was on—

INDIAN GUMS FOR PHARMACY WORK.

BY DR. S. RIDEAL AND W. E. YOULE.

The gums which find their way into the English market from India may be divided roughly into two classes, those which are entirely soluble in water and exude from species of acacia, of which amrad is the most important, and those which are not exudations from acaciæ and do not entirely dissolve in water, known under the generic name of ghatti. These latter gums have recently received considerable attention from pharmacists, owing to the scarcity and high price of genuine gum arabic. The following papers have been published during the last few years:—1887, *Journ. de Pharm.* [5], xv. p. 411, "Gummo-Phosphate of Lime," by Dr. Sambuc; 1888, *Pharm. Journ.* [3], xviii. p. 876, "Ghatti and other Indian Substitutes for Gum Arabic," by A. Mander; *Pharm. Journ.* [3], xix. p. 1, "Notes on East Indian Gum," by J. G. Prebble; *Pharm. Journ.* [3], xix. pp. 339 and 360, "On Gum Arabic and its Substitutes," by T. A. Ellwood; 1889, *Journ. de Pharm.* [5], xix. p. 441, "First Notice of Ghatti Gum"; *Journ. de Pharm.* [5], xix. p. 557, "On Gums capable of Replacing Gum Arabic" (edit.); *Journ. de Pharm.* [5], xx. p. 121, "Austra-

lian Gum," by M. Nauden; *Pharm. Journ.* [3], xx., p. 781, "On Gum Ghatti," by C. F. Henry; 1890, *Pharm. Journ.* [3], xx. p. 717, "Notes on some Gum Samples," by T. Maben; *Pharm. Journ.* [3], xx. pp. 869, 980, "Chemistry and Commercial Possibilities of Wattle Gum," by J. Maiden; *Journ. Soc. Chem. Ind.*, July, 1891, p. 624, "Gum Arabic and its Modern Substitutes," by S. Rideal and W. E. Youle.

Mr. Mander's paper gives a description of the chief varieties of the East Indian gum, both amrad and ghatti, together with oomra wattle. An account of the behaviour of each gum examined with various typical re-agents, ferric chloride, borax, lead acetate, ammonium oxalate, etc., is also given, together with the relative viscosities of the various amrad samples as compared with the B.P. mucilage. It is to be regretted that the viscosity of the ghatti sample was not also given; probably its high strength, which Mr. Mander clearly recognised, was the cause of this not being done. The author found that ghatti mucilage emulsified twice as much oil (olive) as gum acacia, with the production of a much better looking preparation. He also suggested its use for medicinal lozenges. Mr. Henry, in his paper of a later date than the above, agrees generally with Mr. Mander's statements regarding ghatti. He found, as a rule, that only 25 per cent. of the gum was soluble in water, the residue being insoluble in hot water even after prolonged boiling. The mucilage is of greater density than the B.P. mucilage. The ash of the gum averages 1.7 per cent. and contains much more carbonates, and is whiter than the ash of gum arabic. He concludes by recommending ghatti strongly as an adhesive agent.

The general appearance of ghatti gum is probably by this time well known to pharmacists. It occurs in somewhat dullish looking tears of a light brown colour, associated with a number of fragments which are white in colour and vermiform in shape. These latter consist generally entirely of metarabin. The amount of matter totally insoluble in water varies very much, ranging from 5 to 25 per cent. with different samples. "The amount of water in the natural gum is somewhat less than that contained in gum arabic, being about 8 per cent., while the latter average 13 per cent. to 15 per cent." The ash is fairly constant in quantity, being generally about 2.6 per cent., or somewhat lower than that of a genuine gum arabic. We have not observed any very great disproportion in the relative amounts of carbonic acid in gum acacia and ghatti ashes as remarked by Mr. Henry, who finds

much more CO_2 in the latter. On the contrary, we find the total amount of CO_2 obtained from ghattis is somewhat less than from genuine gum arabics. Thus the following numbers were obtained from two representative gum arabics and two ghattis on analysing the ash (*loc. cit.*):—

Sample.	Ca CO_3 .	Mg CO_3 .	$\text{K}_2 \text{CO}_3$.	Total CO_3 . per cent
1. Gum arabic . .	53.90	29.48	17.2	44.62
2. " . .	44.70	34.30	18.01	43.38
3. Ghatti . .	53.50	8.40	7.8	30.79
4. " . .	50.90	10.33	9.29	30.72

The mucilage given by any ghatti is decidedly more viscid than that from the ordinary gum arabics now obtainable. We have obtained, dealing with a large number of samples, the following, among other results, expressed in absolute measure, which show the marked superiority of these Indian gums in this respect:—

Sample.	Per cent. solution.	Absolute viscosities.	Water=100.
1. Gum arabic	10	.1850	1233
2. "	"	.1555	1022
3. "	"	.0480	317
4. "	"	.0430	285
5. "	"	.0639	417
6. Ghatti	"	.2880	2322
7. "	5	.1350	1089
8. "	"	.1760	1420
9. "	"	.1485	1198
10. "	10	.3621	2920 (<i>l.c.</i>)

The above absolute numbers representing viscosity were obtained by the use of a special instrument which we found preferable to a burette for these determinations. It consists of a bulb of about 70 c.c. capacity, upon which, at top and bottom, are blown two smaller bulbs of about 10 c.c. capacity. The small upper or "safety" bulb terminates in a short, wide tube; on to the lower bulb is fused a piece of fine capillary tubing, 10 c.m. long. The gum solution can be sucked up into the bulb and the time occupied by it in again running out into a bottle placed beneath noted in seconds, when the absolute viscosity can be calculated by a simple formula if the dimensions of the instrument be known. If the

solution of the gum, which may be conveniently made to contain 10 per cent. of gum arabics or 5 per cent. of gum ghattis, takes too long to flow out under these conditions, the operation may be accelerated by performing it under diminished pressure. The upper part of the viscosity apparatus is then connected with a partially exhausted bottle, and the gum is sucked up from a bottle, the time taken to fill the bulb thus being noted. The bulb is then emptied under the same diminished pressure (as registered by a mercurial gauge) by connecting the exhausted bottle with the bottle and thus sucking the gum out of the bulb. This second time is also noted; from the mean of the two determinations the absolute viscosity is obtained. This number, which for 10 per cent. solutions is always a fraction, can be returned in a more convenient form by dividing it by the absolute viscosity of water and multiplying by 100. We have described this apparatus at some length in the paper already referred to.

The mucilage is yellowish or light brown in colour when properly made, and is much more permanent and retains its viscosity unimpaired for a longer time than the inferior gum arabics from Senegal and Barbary now in the market. There is, for example, none of the separating into two layers of different colour and widely divided viscosities which is typical of the latter class of gums on standing.

It follows, therefore, from the above average viscosity of ghatti solutions as compared with good gum arabics, that for making up ordinary mucilage according to the Pharmacopœia (1 part gum in $2\frac{1}{2}$ parts water), one must not take less than 8 parts of water to 1 part of ghatti. The mucilage obtained must, of course, be freed from the insoluble lumps of metarabin and is then found to possess the above-mentioned properties. The reactions of ghatti mucilage as compared with that of ordinary gum acacia in weak solutions are summarized in the table (*q.v.*)

From this it would seem that the best reagents to use for the detection of ghatti are ammonium oxalate, ferric chloride, alcohol, and mercuric chloride.

As stated above, ghatti gum solutions do not yield nearly such a copious precipitate with alcohol as does gum acacia. We have tried a series of experiments with these precipitates, especially as regards their optical properties when compared with the original gums. These experiments were carried out as follows: 5 grams of the gum were dissolved in 20 c.c. of water, filtering off the insoluble residue in the case of ghattis. To the cold solution 90 c.c.

	Reagent.	With Ghatti.	With Gum Arabic.
1	Ammonium oxalate.	Slight turbidity.	Copious white ppt.
2	Lead basic acetate.	Slight ppt.	Copious gelatinous ppt.
3	Ferric chloride.	Slight darkening, gelatinous ppt.	No darkening, no gelatinous ppt.
4	Borax.	Gelatinizes.	Does not gelatinize.
5	Stannous chloride.	Bleaches, no ge- latinizing.	Bleaches.
6	Alcohol (equal bulk.)	Slight precipitate.	Copious precipitate.
7	Mercuric Chloride.	White stringy ppt.	No reaction.

of 95 per cent. alcohol was added and the precipitate which formed was thrown on to a tared filter and washed with 30 c.c. more alcohol. Finally it was dried and weighed, then re-dissolved in water and its rotatory power determined by the polariscope. The rotatory power of the filtrate was also obtained. With two gum arabics and two ghattis the following average results were obtained :

Sample.	Weight gum taken.	Weight alcohol precipitate.	Weight gum in filtrate.	(a) _j Original gum.	(a) _j Alcohol ppte.	(a) _j Filtrate
Arabic 1	grms. 5.000	3.1872	1.4162	+66.2°	+57.9°	+55.1°
" 2	5.000	2.3312	2.4108	-38.2°	-20.1°	-64.9°
Ghatti 1	3.245	.4065	2.8385	-140.8°	-106.0°	-72.4°
" 2	2.255	.2900	1.8078	+147.06°	-106.04°	-69.0° (loc. cit.)

The ghattis are generally lævorotatory, and the alcohol precipitate is apparently of a different kind to that yielded by gum acacias; that is, the precipitate is more lævorotatory than the filtrate, while the opposite is the case with gum arabics, whether they are lævo- or dextro-rotatory. Both classes of gums, however, it would appear from these experiments, consist of at least two kinds of gum, one of which is more soluble in alcohol than the other and differs in its action on polarized light. Similar work done by O'Sullivan with pure arabin points to the same conclusion.

These results are interesting from a pharmaceutical point of view, as it may be found possible to obtain from ghatti gum, by fractional precipitation with alcohol, a gum which will be identified with ordinary gum arabic. We are still working in this direction.

A few remarks on the subject of making up ghatti mucilage may here be of interest. As is well known, commercial samples of this gum are generally dirty and admixed with bark, in fact the tears frequently contain thin scales of bark on their flat surface. As the bark of the *Anogeissus latifolia*, from which ghatti is an exudation, is astringent, the commercial gum contains more or less tannin. The presence of tannin in the mucilage causes a darkening with ferric salts and also spoils the colour of the original mucilage. The tannin can be almost entirely prevented from getting into solution and a bright light-coloured mucilage obtained by observing the following precautions.

The gum should be ground to powder in porcelain or stoneware mortars, not *iron*. The weighed quantity of powdered gum is then placed in a copper or earthenware basin and about half the quantity of cold water required for the finished mucilage is then added and the whole well stirred until the metarabin has swollen up and separated from the soluble gum. The mucilage is then strained through muslin and the swollen pieces of insoluble gum are picked out of the cloth and returned to the basin. The second quantity of water is now added to the insoluble and the undissolved gum and after stirring left in contact, until only white jelly-like lumps of metarabin are left undissolved. The second batch of mucilage thus obtained is also strained through muslin and united with the first. By this double treatment with cold water not only is a better mucilage obtained, but most of the bark is caught on the muslin at the first filtration when only a trace of it has dissolved and thus the finished solution contains only a minute quantity of tannic acid and gives no appreciable darkening with iron salts. The whole operation also should be conducted as rapidly as is consistent with getting a strong mucilage, as the solubility of tannin from the bark is not marked in cold water until it has been well soaked. If the mucilage be made with hot water, a considerable darkening of the gum takes place.

Ghatti gum which has been ground in iron vessels and thereby become contaminated with a trace of ferric oxide, even when treated with only cold water, forms an exceedingly dark-coloured solution on standing some time. The appearance of the three kinds of ghatti mucilage referred to, viz., cold, hot, and mucilage contaminated with iron by grinding in an iron mortar, is very marked, and it is easy to identify them.

Mucilage made up in accordance with the foregoing directions from ghatti gum is in our opinion quite capable of replacing gum

acaciæ for pharmaceutical work. We have demonstrated experimentally that the solution is capable of the same suspensory power, *e.g.*, for making *Mistura cretæ*, and is equally as good in adhesive value for making the officinal lozenges. When freed from tannin it gives no darkening with iron salts, and it possesses an advantage over gum acaciæ in that it can be compounded with a small quantity of alcohol. In this respect it forms a mucilage intermediate between mucilago acaciæ and the mucilago tragacanthæ. It emulsifies more oil than gum acacia, producing a snow-white emulsion.

The keeping qualities of ghatti mucilage, as already mentioned, are equal to those of best gum acacia and are decidedly superior to that of the solution prepared from the inferior gums from the Cape, etc., now in the market. Another point in which ghatti can claim a distinct advantage is its price, which is decidedly lower than that asked for senegals, Cape and other gums of a quality suitable for pharmaceutical work. Really good ghatti can be purchased at an average price of 40s. to 45s. per cwt., while the higher grades of the gums mentioned which yield a light-coloured mucilage cannot be purchased under 65s. to 80s. per cwt.

The other gums which come from India under the generic name of Indian amrad are not of much importance from a pharmaceutical point of view. They form a class which in physical properties, etc., resemble second-rate gum arabic. Only the best grades give a light-coloured mucilage, although they possess the advantage over ghatti of being entirely soluble in water.

At the conclusion of the paper,—

The PRESIDENT said gum arabic had been very scarce of late, but he hoped when the Nile was opened up they might receive some of the supplies which must be hoarded up in the interior. In the meantime they had been placed in great difficulty, and ghatti gum was no doubt of great service for many purposes, especially for use in the arts.

Mr. STROTHER said he had used ghatti gum for making mucilage, and believed it to be very good in some cases; but after a practice of twenty-five years he had not yet succeeded in making good lozenges with it.

Mr. BOA had had considerable experience with ghatti gum, both for pharmaceutical and industrial purposes. In making mucilage for pharmaceutical purposes he had found that a proportion of one

to six or seven corresponded with the official mucilage made from genuine gum acacia. It seemed to him, however, that until this gum was officially recognised it ought not to be used in place of gum acacia, though it might for certain special preparations not official. In working with it experimentally for official preparations he found it produced different colours in certain cases. He had been less successful with the powdered variety commercially supplied than with the gum bought in the rough state. In making mucilage he found it better to reject the vermiform pieces and select only the more globular clean pieces, from which a nice mucilage might be obtained by the usual means, which was very useful for emulsifying and suspending purposes. In some instances it had a taste readily distinguishable from that of acacia mucilage. For industrial purposes it was often used ground up in the form of a paste; mosaic workers used it in this manner, and found it gave better results than gum acacia at double the price.

MR. GERRARD said he had to prepare considerable quantities of emulsions from time to time, and on one occasion was tempted to use powdered ghatti gum, but was not very well satisfied with it. It did not give a clean emulsion, because in grinding particles of bark and other matters got ground up with it. To separate these by picking was tedious and troublesome, and even then the cleaning was not complete, and a good deal of impurity was ground up with the gum. The consequence was that after the emulsion had stood for a few days a considerable quantity of gritty and unsightly matter settled at the bottom, and the use of such a gum did not seem proper for the manufacture of official or medicinal preparations. He observed that in one case viscosity was spoken of as if it were a convertible term with adhesiveness, which was not the case. Another point was that ferric chloride and ferric nitrate gave a precipitate from mucilage made from ghatti gum, but not from gum acacia; but he had never met with a solution of gum acacia which did not give a precipitate with ferric chloride.

MR. BIRD said he had had considerable experience with this gum, having on the appearance of Mr. Mander's paper made a number of experiments to ascertain its capacities, and he could endorse all that had been said as to its emulsifying and keeping qualities. The difficulties found by some previous speakers had no doubt been caused chiefly by their using an unpicked sample. It was not at all difficult to find a sample which had been picked over, and all the white and best gums selected, and such samples gave very excellent results. In preparing mucilage his practice

was to place the gum in water for about half a day, stirring it frequently. It was then strained, and if it were a good sample very little residue remained. To his mind the chief objection to this gum was the peculiar odour which he always observed in it.

Mr. DOTT asked what advantage the apparatus described for ascertaining the viscosity possessed over an ordinary large pipette.

The PRESIDENT said it was undoubted that strong solutions of gum arabic gave a precipitate with ferric chloride and also with borax, but it was much more marked with the ghatti gum. He had not found much difficulty in making a mucilage, especially in the method described; but he had heard that such mucilage was apt to become fungoid if made of a strength of 1 to 8, unless some antiseptic were added. He understood that this took place more rapidly than with gum arabic. He concluded by proposing a vote of thanks to the authors of the paper.

The vote of thanks was carried unanimously.

Dr. RIDEAL, in reply, said lozenges would have to be made with this gum by a formula totally different from that employed with gum arabic. It would not be possible to add the powdered gum in making the lozenges, but he had been informed that lozenges had been made on a large scale with this gum, making a very strong mucilage in the first instance. Mr. Boa had suggested a strength of 1 to 6 or 7 instead of 1 to 8, as more nearly corresponding to the Pharmacopœial preparation. The fact was that these gums varied considerably in the proportion of insoluble matter, and therefore the amount of soluble matter would vary inversely; probably from 1 to 6 to 1 to 8 would be the proportion. The vermiform gum was insoluble, and it was well therefore to avoid it for making mucilage. The dark colour which Mr. Gerrard had found might perhaps be due to the use of an iron mortar. It was quite obvious that this gum was not equal in value to gum acacia; an article sold at 40s. a cwt. could not be expected to equal one which fetched 80s. By all means he would say use pure gum acacia if you could get it, but if you could not, this ghatti gum was worth a trial. He did not think it was correct to say that it was peculiarly liable to a fungoid growth; he had specially studied this point and knew that it kept very well. With regard to the reaction with ferric chloride, he meant to convey that in the case of the ghatti gum it was much more marked than with gum acacia.

In the absence of the author the next paper was read by Mr. W. A. H. Naylor.

NOTES ON THE ESTIMATION OF VOLATILE OIL IN COPAIBA.

By R. A. CRIPPS, F.I.C.

For the estimation of volatile oil in copaiba it is customary to heat a small quantity (1 to 1.5 grams) until the resin becomes of a full brown colour, and vapours of volatile oil no longer arise. The operation is usually performed in a dish, either by employing a long-continued temperature of 100° C., or by a shorter application of a heat of about 150° to 160° C. In the former case the experiment is tedious owing to the retarding influence of the resin upon the volatilization of the last portions of volatile oil; this is to a certain extent, but by no means satisfactorily, avoided by the use of the higher temperature; in this latter case, especially, the darkening of the resin would indicate some change in the resin itself.

I have sought to expedite the estimation and retain the resin in an unaltered condition by the use of steam, whereby the volatile oil is very rapidly removed with a minimum of heat and consequently a minimum of change.

The apparatus consists of a flask, fitted with a safety-tube, and a tube bent twice at right angles. This tube passes through the cork (not india-rubber bung) of a second small weighed flask, and reaches very nearly to the bottom. The small flask also carries a bent tube, having a bulb blown in it and joined by a rubber collar to another tube passing into a test-tube, the latter being partially cooled by immersion in water.

Into the small weighed flask introduce about 0.5 gram of copaiba, accurately weighed, with about 5 c.c. of distilled water, and about two-thirds fill the larger flask with water. Insert the corks and boil the water in the larger flask; a jet of steam will now be driven into the smaller flask, the force of which must be moderated by attention to the source of heat; it must not be so rapid as to splash the copaiba on to the cork. To avoid this I have also found it advantageous to bend up the lower end of the tube passing into the smaller flask, directing the opening towards the nearest side of the flask, which thus breaks the force of the jet. As soon as the smaller flask becomes about one-fourth filled with condensed water, a gentle heat is applied by means of a spirit

lamp. The volatile oil passes over with the steam into the connected test-tube. The object of the bulb in the tube passing from the smaller flask is to retain any minute portions of resin which might accidentally be carried over during the distillation.

After the steam has been continuously passing for half-an-hour the sources of heat are removed, the lower end of the tube passing into the smaller flask, and the bulb in the exit tube washed into the flask with a little spirit to remove any adherent resin, the flask placed upon its side on the water-bath till all visible moisture is removed, and finally dried for half-an-hour in the air-oven at 100° C. The weight of resin obtained gives, by difference, the quantity of volatile oil. The resin so obtained is of a pale colour, and quite brittle.

I have estimated the resin in this way, varying the length of time from 15 minutes to 3 hours, with results which indicate that the removal of the volatile oil is practically complete after half-an-hour; indeed, the resin obtained after only 15 minutes is quite brittle, the difference between this and half-an-hour being under 1 per cent.

I have found this method of distillation to be admirably adapted for the detection of turpentine in copaiba, for at the very first appearance of steam in the tube between the smaller flask and the test-tube the odour of turpentine is readily distinguished at the mouth of the test-tube. It is for this purpose only that the test-tube is introduced into the apparatus.

According to my experience, however, turpentine is now but seldom employed to adulterate copaiba.

For the after-examination of the resin it is perhaps more convenient to transfer the contents of the small flask to an evaporating basin for the final drying, taking care to thoroughly rinse out all resin with spirit and with ether.

The following amounts of volatile oil have been found in commercial specimens by this method:—40·95, 45·0, 45·3, 46·4, 47·8, 48·2, 49·6, 50·4, 50·8, 53·3, and 59·6 per cent.

The estimation of volatile oil enables one to determine the amount of potassic hydrate required to saponify the resin, as the volatile oil itself is not acted upon. I have found this to vary from 12·1 to 19·3 per cent. as extremes, but to be usually between 16·0 and 17·0 per cent.

This apparatus will doubtless prove useful in the estimation of volatile oils, etc., in other substances, *e.g.*, balsam of Peru, Canada balsam, colophony, etc.

My thanks are due to Messrs. Southall Bros. and Barclay for permitting these experiments to be carried on in their laboratory.

The PRESIDENT said Mr. Cripps had devised a very useful apparatus to prevent the burning of the resin. He thought the proportions he mentioned were about the same as had been given by previous writers.

Mr. R. H. DAVIES said he did not quite understand whether the percentage of potassic hydrate required to saponify the resin was stated in terms of the original copaiba or of the resin. It was stated that from 12 to 17 per cent. of potash was required, which would be a matter of some interest, as they were told that the potash had no action on the oil. The apparatus was an ingenious one, though the passage of steam through substances containing essential oils for the purpose of extracting the oils was not novel; but he did not know that it had been applied before to oleoresins, and the apparatus seemed likely to serve the purpose very efficiently.

Mr. Moss thought the apparatus might be admirably adapted for the estimation of essential oils, and not only so, but for the actual production of the oils themselves on the commercial scale. He had used this process for the preparation of oil of copaiba for some time past. Anyone who attempted to distil copaiba oleoresin with water and tried to get the oil knew the operation was a very lengthy one; but if live steam were passed through it under pressure it carried away the oil with it, and thus an operation which would otherwise take some days was very much shortened. He had not used anything like the bulb in Mr. Cripps' apparatus, but it struck him that it would be an improvement.

The PRESIDENT remarked that if turpentine were used as an adulterant it would come over first in the distillation and be easily recognised.

Mr. Moss said turpentine was not often found now, the adulterant being generally something of the nature of gurgun balsam. The copaiba which came from Hamburg was sometimes open to the suspicion of an admixture of that kind.

Mr. NAYLOR said he thought Mr. Davies' question would be answered by one sentence in the paper, which he would again read. He took it the author meant the percentage of the resin.

On the motion of the President a vote of thanks was passed to Mr. Cripps.

In the absence of the author, the next paper was read by Mr. Ransom.

LIQUID PERSIAN GALBANUM.

By E. M. HOLMES, F.L.S.

On several occasions during the last twenty years there has been imported into the London market a reddish brown liquid galbanum of the consistence of Venice turpentine. It differs so much in appearance and in odour from ordinary solid galbanum that it has never met with a ready sale. Having recently had occasion to examine some of this product I found in it two or three fruits, which might possibly, but not necessarily, belong to the plant yielding it, and therefore seemed worthy of a careful examination.

An examination of the fruits might at first sight appear unnecessary, inasmuch as text-books on materia medica give two or three plants as the sources of galbanum, and it might therefore be supposed that the botanical sources of the drug were definitely set at rest. But a very little investigation leads one to the opposite conclusion. Thus the authors of *Pharmacographia* remark:—"The uncertainty that exists as to the plants which furnish asafetida hangs over those which produce the nearly allied drug galbanum. Judging from the character of the latter it can scarcely be doubted that it is yielded by umbelliferous plants of at least two species, which are probably the following, viz.:—1. *Ferula galbaniflua*, Boiss. et Buhse; 2. *Ferula rubricaulis*, Boiss. et Buhse.

On turning to the still more recent *Pharmacographia Indica* (May, 1890, p. 152), it is evident that the authors have been greatly misled by the statements of previous writers, for they give *Ferula rubricaulis* and the plant called *F. galbaniflua* by Dr. Aitchison as sources of the gum resin. A brief review of the present state of our knowledge concerning the drug is therefore necessary to a clear understanding of the position which liquid Persian galbanum holds with respect to the other commercial varieties, and of its relation to the plants said to yield them.

Commercial galbanum has been described by most writers on materia medica as being of two kinds, viz., Levant and Persian, each of which exist in two or more varieties. So far as the specimens in the Museum of the Pharmaceutical Society are concerned these are *Levant galbanum* in three distinct forms:—

1. In the tear.—These consist of distinct nodules, either opaque or translucent.

2. In small lumps, consisting of opaque small yellow translucent tears, mixed with portions of the stalks and sometimes fruits.

3. In masses consisting of translucent yellowish small fragments, and larger bluish or greenish soft portions, the whole mixed into a sticky mass and containing sections of the root.

The first two are rarely seen in commerce, the third is the article imported during the last ten years. All three have a decided musky odour.

II. *Persian galbanum*.—This exists in the Pharmaceutical Society's Museum under two forms—

1. A mass of small sticky tears with a varnished appearance, and mixed with fragments of stems and fruit stalks, etc.

2. A brownish or reddish brown liquid of the consistence of Venice turpentine, which is the subject of this article.

Persian galbanum differs in the possession of a turpenty odour in addition to that of galbanum. Hirschsohn¹ has pointed out that the Persian and Levant kinds may be distinguished also by chemical tests as follows:—Levant galbanum, either crude or in the form of a petroleum extract, gives with 1 part of sulphuric acid and 3 of alcohol a reddish violet or blue-violet colour, the former being the case with the variety containing translucent tears and portions of stalk, and the latter with the variety containing bluish tears and portions of root.

Hydrochloric acid gives also a bluish violet or a reddish violet (and with one sample no colour at all). A mixture of chloral and chloral hydrate gives a rose-coloured solution, passing through blue to green, with the Levant variety containing stalks; and a yellowish red solution passing into a dirty green, but faintly rose-coloured at the edges, with Levant galbanum containing sections of the root.

Persian galbanum gives with sulphuric acid and alcohol a yellowish brown solution, and with chloral and chloral hydrate an intensely green solution. Hydrochloric acid gives a reddish-yellow colour.

It will be easily understood that it is scarcely likely that these products are all derived from one species, but that they are probably derived from at least three different plants.

The geographical and botanical sources of these varieties of gal-

¹ *Plarm. Journ.* [8], vii. pp. 891, 572.

banum are involved in some obscurity. "Levant," a word meaning The East, is loosely applied to the Eastern countries of the Mediterranean basin.

The term "Levant" applied to galbanum might therefore mean only that the drug was imported from some Turkish or Egyptian port, or even from Trebizonde or Trieste, and no clue is thus afforded as to its geographical source. It appears, however, from *Pharmacographia*, that in the second century A.D. galbanum was among the drugs on which duty was levied at Alexandria, and that in A.D. 1503 it reached England by way of Venice. In *Pharmacographia Indica* it is stated that "In India galbanum is little used, the bulk of what is imported into Bombay being sent to Egypt and Turkey under the name of Jawáshir," and further that it reaches Bombay from Persia. I have also seen in the Kew Museum a specimen of modern Levant galbanum from Kurrachee in the Persian Gulf.

We thus arrive at the conclusion that the so-called Levant galbanum is really of Persian origin.

With respect to the galbanum distinguished in commerce as Persian, it is stated in *Pharmacographia* that considerable quantities of galbanum reach Russia by way of Astrachan and Orenburg. Hirschsohn (*Pharm. Journ.* [3], vii. p. 371) confirms this statement. Moreover, specimens in the Daniel Hanbury collection of materia medica from Astrachan are undoubtedly of the kind known in commerce as "Persian."

It is obvious, therefore, that all the varieties of galbanum of commerce come from or through Persia.

The evidence respecting the botanical source of galbanum is by no means as satisfactory as could be desired.

This arises from the fact that travellers and botanists are, as a rule, not familiar with drugs, and as the same native name is applied in different districts to different products, much confusion has of necessity arisen. It is necessary, therefore, to sift as far as possible the information at our disposal.

It appears that Buhse collected in Northern Persia a plant which he stated to be the source of galbanum, to which the name *Ferula galbaniflua* was given by Boissier. This is the plant which is usually given as one of the sources of galbanum, but there is no evidence to show which variety of the drug it yields.

A second plant, *Ferula rubricaulis*, Boiss., is given in *Pharmacographia*, in Bentley and Trimen's *Medicinal Plants*,

and still later in *Pharmacographia Indica*, as a source of galbanum.¹

This, as I have shown in 1888 (*Pharm. Journ.* [3], xx. p. 365), is an error, the plant having a distinctly alliaceous taste and odour, which is never present in true galbanum. The history of the error is as follows: Boissier described a plant, or rather a mixture of two plants, under the name of *Ferula erubescens* (*Ann. Sc. Nat.*, 1844, p. 316). The two plants confounded under this name he subsequently separated as *Ferula rubricaulis* and *Ferula gummosa* (Boiss., *Diagn.*, sec. ii., 2, p. 92), and finally sunk the latter under *Ferula galbaniflua*, as var. β -*Aucheri* (Boiss., *Fl. Orient.*, vol. ii. p. 989).

It would thus appear that galbanum is afforded by two plants growing in Northern Persia, and which are *Ferula galbaniflua*, Boiss., and *F. galbaniflua*, var. β -*Aucheri*, Boiss., but that it is not the produce of *F. rubricaulis*.

But a third plant² is stated by Borszczow to afford galbanum. This is *Ferula Schair*, Borszcz., a plant growing on the confines of Siberia and Turkestan. He observed a milky juice to exude from the cut stem which had completely the odour of galbanum, and the scent was so strong as to be observed to a considerable distance. This plant does not appear to exist in either of the national herbaria in London, and I have had no opportunity of comparing its taste with that of galbanum.

Dr. Aitchison lately recorded the occurrence of the galbanum plant, *F. galbaniflua*, Boiss., in Afghanistan. But through his kindness in presenting to the Society a specimen of the plant collected by him, and through that of the Director of Kew Gardens in presenting a small portion of the gum resin collected from the plant, I am enabled to state that the plant collected by Dr. Aitchison cannot be the source of galbanum, since the gum resin does not resemble the galbanum either in appearance or in taste, whilst the chemical examination to which it was submitted by Mr. E. G. Baker shows that even in chemical characters it does not agree with galbanum. Dr. Aitchison has himself pointed out that this plant differed from Buhse's plant in having a hollow instead of a solid stem, but that it seemed otherwise to agree with Buhse's description.³ He mentions also that it had an odour of celery

¹ An excellent figure of *F. rubricaulis* is given by Berg and Schmidt, *Officin. Gewächse*, t. 31 b, under the name of *F. erubescens*, Boiss.

² Mentioned in Bentley and Trimen's *Medicinal Plants*, No. 128.

³ The striking resemblance of different species of umbelliferæ is very remarkable. Of this *Dorema Ammoniacum* and *Ferula Nartex*, *Ferula fatidissima* and *F. Jaeschkeana* are remarkable instances.

when fresh. He was probably misled by the native name "Birzand Jaoshir" given to the resin, Gaoshir¹ being the Bombay name for galbanum. The plant evidently resembles it in appearance, but cannot be identical with Buhse's *F. galbaniflua*.

From the account given by Borszczow of *Ferula Schair* it would seem probable that this plant may be the source of the Persian galbanum of commerce, which has a remarkably penetrating odour. Its place of growth would also explain its entering commerce by way of Russia.

So far as can be deduced from the evidence at present obtainable it appears probable that the so-called Levant galbanum is afforded by *Ferula galbaniflua* and its var., β -*Aucheri*, and the so-called Persian galbanum by *Ferula Schair*, Borszczow.

But the results obtained by an examination of the fruits found in the liquid Persian galbanum, and of the gum-resin itself, indicate that this form of the drug is probably collected from a different species from any of those already mentioned.

A section of the fruit compared with that of Boissier's specimens of *Ferula galbaniflua* shows that the structure is almost identical in both. The vittæ are large and fill the vallecule (or spaces between the dorsal ridges) and appear to be septate, the septum being near the ridges, thus indicating that a second and narrower vittæ is present in each vallecule, and runs parallel with the first. These vittæ are not easily seen from the exterior.

In *Ferula Schair*, as represented in Borszczow's illustration, the vittæ are single and of small size in each vallecule, and the fruit is not winged.

When a small portion of the liquid Persian galbanum is either shaken or warmed with a mixture of one part of sulphuric acid and three of alcohol, a beautiful bluish violet colour is developed, deeper in tint and more distinct than in any variety of Levant galbanum similarly treated. For the purpose of comparison some of the original specimens of Persian and Levant galbanum examined by Hirschsohn were treated in the same way by Mr. J. Eastes and myself. (These specimens exist in the Hanbury collection of materia medica, and are portions of those sent by the late Daniel Hanbury to Hirschsohn.)

It is evident from the above-mentioned results that whilst in chemical reaction the liquid Persian galbanum approaches very closely to the Levant kind, it is entirely different in its odour and

¹ The same name is stated by Dr. Polak to be given to *Diploptania cachrydifolia*, Boiss., but he spells the word Dschawshir.

taste as well as in its physical characters. It is therefore only possible to conclude that liquid Persian galbanum must be derived from an undescribed species nearly allied to *F. galbaniflua* (Boiss.), if that plant really is the source of Levant galbanum. It must be acknowledged, however, that so far as the taste of the fruits of Boissier's specimens is concerned, that of the *Ferula galbaniflua*, β -*Aucheri*, Boiss. (= *F. gummosa*, Boiss.), approaches more nearly to that of the Levant galbanum than do the fruits of the typical plant. In conclusion, I may remark that Levant galbanum, when heated, gives off a pleasant aromatic scent, but that Persian galbanum gives off a turpentine odour sufficiently disagreeable to render it easy to understand why galbanum has been sometimes classed among the fœtid gum-resins. If galbanum is really the galbanum used by Moses¹ in the preparation of the sacred incense, it was probably the Levant and not the Persian kind that was employed.

The PRESIDENT, in proposing a vote of thanks to Mr. Holmes for the paper, said he had sent a few microscopic slides which could be examined at the close of the meeting. It was very difficult at present to get a drug at all bearing the character of the true galbanum, and the paper was therefore all the more valuable.

The next paper was—

A SHORT DESCRIPTION OF THE PRESENT AND FUTURE WATER SUPPLY OF CARDIFF.

By THOMAS HUGHES, F.I.C., F.C.S.

As will be seen from the present census the population of Cardiff has increased very much of late, and several years ago the Corporation, foreseeing this, determined to increase the supply of water, and concluded to expend no less than £373,000 in order to get a large and pure supply from the Upper Taff Valley.

Before referring to the Taff Fawr works and the quality of the water, I will deal shortly with the present sources of supply, as these can always be used to supplement the Taff Fawr in the future should that supply prove temporarily inadequate.

¹ Exodus xxx. 34.

There are two sources whence the present public supply is taken, viz., the Ely Pumping Station and the gathering grounds of Lisvane and Llanishen.

The water from the Ely Pumping Station is obtained from headings or culverts driven into the magnesium limestone by the side of the river for collecting the water. Although, no doubt, some river water percolates through the gravel and sand of the bed of the river into these headings, yet the bulk is obtained from the strata itself, the water pumped being much harder than that of the river.

The total solid matter in solution in the river water is from 18 to 20 parts per 100,000, and the total hardness is about 12 parts, whereas that from the strata has about 32 parts of solid matter and a total hardness of from 28 to 30 parts.

Analyses of Water from Ely Pumping Station in Parts per 100,000.

	Total solid matter.	Albuminoid ammonia.	Free ammonia.	Nitrogen as nitrates.	Previous sewage or animal contamination.	Chlorine as chlorides.	Sulphuric acid as sulphate.	Magnesium salts.	Hardness.			Date.
									Temporary.	Permanent.	Total.	
A . . .	32.25	0.004	nil.	0.14	trace	1.95	3.19	excessive	15.6	14.5	30.1	1890
B . . .	30.8	0.012	0.002	0.12	"	1.85	3.20	"	15.0	14.3	29.3	"
A . . .	30.0	0.007	0.003	0.13	"	1.75	3.22	"	15.2	12.3	27.5	1891

A. These samples were clear and practically colourless.

B. Sample of a faint yellow colour, but clear.

The total amount of water obtained from this source is about one million gallons per day, part being pumped into the Cogan and thence into the Llandough reservoir, and from these tanks the outlying districts of Cogan and Penarth are supplied by gravitation, the remainder being usually pumped directly into the mains for the use of parts of the Canton district—the Penhill reservoir, near Llandaff, being now but little used for distribution. There is a good deal of cultivated land about the gathering ground, and the strata being somewhat broken or fissured permits the surface polluted water to travel considerable distances, and it will be noted from the above analyses that the water obtained from this station contains distinct traces of nitrates.

This source cannot be considered all that is desirable for a public supply, for, apart from the somewhat suspicious character

of the gathering ground, it contains an excess of magnesia and other hardening salts, and is unsuited for such domestic purposes as washing.

The sources whence the Llanishen and Lisvane reservoirs draw their supplies are the streams Nant Mawr, Llanishen Brook, Nant Draw, Nant Felin (two branches) and Nant Dulas, which rise in the gathering ground formed by the Lisvane hills, occurring to the south of the Caerphilly range.

This gathering ground embraces an effective area of about 2,200 acres, consisting of mountain, arable and pasture land, by no means highly cultivated and so tolerably free from manurial pollution. One of the brooks in the north-east of the water-shed passes through ground of a peaty character, and is usually strongly

Analyses of Water from the Llanishen Filter Beds in Parts per 100,000.

	Total solid matter.	Albuminoid ammonia.	Free ammonia.	Nitrogen as nitrates.	Previous sewage or animal contamination.	Chlorine as chlorides.	Sulphuric acid as sulphates.	Magnesia salt.	Hardness.			Date.
									Temporary.	Permanent.	Total.	
A	18.4	0.009	0.001	0.01	—	1.6	1.68	slight	3.8	12.6	16.4	1890
B	17.8	0.009	0.002	0.02	—	1.55	1.95	"	3.5	12.8	16.3	"
C	18.8	0.012	0.002	nil.	—	1.45	1.88	"	5.0	11.9	16.9	1891

A. Very faint yellow colour and clear.

B. Ditto.

C. Yellowish colour, but clear.

coloured with organic matter, thus conferring a somewhat peaty character on the whole supply.

These streams yield about two million gallons per day, of which the greater proportion is obtained from the Nant Mawr and Llanishen Brooks, although the former has occasionally become turbid and discoloured from marly matter in suspension obtained from the red marls covering the Old Red Sandstone, which form part of the gathering ground and through which it passes.

Owing to the large amount of water rising as springs from a band of carboniferous limestone on the north-west portion of the gathering ground, the supply is rather hard, though much less so than that of the Ely, as will be seen from the analyses.

For a town supply the chief objections to this source are the amount of organic pollution, although this is not, as a rule, exces-

sive, and its hardness. There is also the restricted character of the gathering ground to be considered and the tendency to growth of population in this district, with its increased risk of pollution.

No doubt the present supply, the best of the water being taken, will form a valuable adjunct at need, but there can be no doubt that a further and purer supply will soon be urgently needed, and this is to be procured from the Taff Fawr Valley.

The present sources yield about 20 gallons per head of the population.

The River Taff, which passes through Cardiff, takes its rise in the Blaen Taff Fawr, between the Gryn and the Beacons in Breconshire, and it is from this valley that the new water supply is to be taken. The valley is on the Old Red Sandstone, and its available

Analyses of Taff Fawr Water in Parts per 100,000.

	Total solid matter.	Albuminoid ammonia.	Free ammonia.	Nitrogen as nitrates.	Total nitrogen found.	Previous sewage or animal contamination.	Magnesia salts.	Chlorine as Chlorides.	Hardness.			Date.
									Temporary.	Permanent.	Total.	
Taff Fawr												
Hendre Isaf	6.4	0.0055	0.003	—	0.008	—	—	0.75	0.1	4.3	4.4	1881
Taff Fawr												
Crew Isaf .	8.0	0.0035	0.0025	—	0.005	—	—	0.65	1.5	3.2	4.7	1881
Taff Fawr .	5.6	0.005	0.002	—	0.007	—	—	0.75	0.4	3.5	3.9	1890

All samples were clear and practically colourless.

rainfall is considered to be about 35 inches, as against 17 inches in the Lisvane gathering-ground. The total area of the watershed is estimated at 10,400 acres, and consists of mountain pasture land.

The portion of the scheme already in hand and approaching completion takes up a drainage area of 4,000 acres. These works consist of one storage pond at Crew Isaf, called the Cantreff Reservoir, having a storage capacity of 320 millions of gallons, with the necessary pipe line to Llanishen, three relieving tanks en route, and a small covered reservoir of half a million gallons capacity, with filters for the supply of Penarth, Llandaff, and other high-lying places, by gravitation.

The large reservoirs already at Llanishen are to be used as distributing ponds in the new work, and into which the Taff Fawr

water will be finally discharged on its way to Cardiff. The estimated cost of this portion of the works is £240,000.

Mr. Williams, the borough water engineer, estimates that when the Cardiff reservoir is completed and filled, and the two storage reservoirs at Llanishen and Lisvane are filled with Taff Fawr water amounting to 700 millions of gallons, the district of Cardiff can be supplied by judicious management with nearly four millions of gallons per day in a very dry year like 1887, after providing the statutory quantity of compensation water to be sent down the river for the upper 4,000 acres of gathering ground, amounting to 2,979,000 gallons per 24 hours.

The quality of the water is excellent, being very soft and most favourably free from organic contamination. The total solid matter varies from 6 to 8 parts, and other constituents are satisfactory, as may be seen from the analyses quoted. In its chemical constitution the water closely resembles that of the Manchester supply, but is superior to it in its physical character. It also resembles the Loch Katrine water, but is somewhat "harder," which, however, in my opinion, is by no means a drawback.

The bleak and uncultivated character of the district, and its distance from the centres of population, appear sufficient to guarantee safety from future pollution, and this, taken with so much as is known of the character of the water, and its almost unlimited abundance, seems to show that in going to its natural gathering ground Cardiff has secured one of the finest in Great Britain.

In conclusion I beg to express my thanks to Mr. J. W. Thomas, my predecessor, for the use of his notes and work on this subject, and also to acknowledge my indebtedness to the report of the borough engineer, Mr. Priestly.

The PRESIDENT remarked that with the rapid growth of population in Cardiff it was well to look ahead in such an important matter as the public water supply, and he was glad to hear that there was a likelihood of getting from the upper reaches of the Taff a supply which would compare in purity with that of Manchester from Thirlmere. He should like to know the degree of hardness of the new supply; he understood that the present supply was from 20 to 30 degrees, whilst that from the river was only 12. He should also like to know whether the present supply ever showed any opalescence, such as was sometimes shown by waters which contained carbonate of magnesium in solution.

Mr. J. BARCLAY asked if the action of the proposed water on lead had been tested. Many moorland waters were so soft that they had a strong action on lead pipes; in Sheffield, for instance, lime had to be added to the water before it could be used safely.

Mr. R. H. DAVIES was glad to find that the municipality were going to work so liberally. He should like to know the degree of freedom from organic matter possessed by this water.

Mr. DOTT said Edinburgh was at the present moment engaged in the same task of looking out for a fresh water supply. The composition of this water seemed much the same as that of Edinburgh, and that had little or no action on lead. The present Cardiff supply of 20 gallons per head was very small.

Dr. RIDEAL said the question of the action of the new water supply on lead pipes was most important. In some towns where a soft moorland water supply had this effect, the difficulty was got over by using for the pipes an alloy of lead and tin. It was quite worth while spending a little more time and energy in working such an alloy, as the results obtained by its use were highly satisfactory.

Mr. SCHACHT asked if there were any chance of utilizing the magnificent mass of water which is being pumped daily out of the Severn Tunnel for some of the large towns on that side of the river. It was not comparable with so-called well water in respect to freedom from inorganic matter, but he understood that was remediable, and it was almost absolutely free from organic impurity of any kind whatever. At one time it was contemplated to bring it to Bristol as an addition to the present supply, but the project was defeated mainly owing to the opposition of the existing water company. One of the chief objections put forward was the large amount of saline matter it contained, but its purity in other respects was admitted. Some samples of it had passed through his hands, and he was perfectly astounded at its freedom from organic matter. Another objection was that to bring this water to Bristol would necessitate the making of another tunnel under the bed of the Severn, but this would not apply to its utilization for any of the towns on that side.

Mr. ATKINS, who had not heard the whole of the paper, but should take care to read it, said there was a most intimate connection between a pure water supply and the health of a community. In his own town (Salisbury), with a population of about 18,000, until a supply had been obtained from a deep well in the chalk, the only objection to which was that it was a little hard,

the death rate had been 32 or 33 per thousand, but since then it had been reduced to 15 or 16. There had no doubt been an improvement in the general sanitary arrangements also, but the medical men attributed the enormous reduction in the death rate which immediately followed the pure water supply as being produced by it.

The PRESIDENT remarked that for a town or domestic supply the happy mean between too hard and too soft a water was the best.

Mr. HUGHES, in reply, said the question of the action of the water on lead was gone into before the Parliamentary Committee, and it might be taken that the result was satisfactory, but not having gone into that point himself he had not alluded to it. The present supply of water from the Ely pumping station was never opalescent, but was quite clear. The hardness of the proposed supply was very low, viz., between 4 and 5 parts, and of total solid matter 6 to 8 parts per 100,000. It was also very satisfactory with regard to organic matter, only 0.3 to 0.6 parts per 1,000,000. This was accounted for by its coming from mountainous ground which was entirely uncultivated. The present supply was no doubt very small; that was why it was necessary to add to it. With regard to the Severn Tunnel water, one great objection was its excessive hardness; if he remembered rightly it was impossible to reduce it below 17 parts per 100,000 even with the aid of Clark's process, which made it unsuitable for a public supply.

A vote of thanks was passed to Mr. Hughes for his paper.

The next paper was on—

THE ALKALOIDAL VALUE OF SOME COMMERCIAL HENBANES.

BY A. W. GERRARD.

It will be within the recollection of many members of this Conference that at the Leeds meeting I presented a communication on the "Alkaloidal Values of Annual and Biennial Henbanes," the samples examined being from plants grown in various parts of this country. At the time my paper was read I had no intention whatever of carrying my investigation of the subject any further, as it was satisfactorily shown that the leaves of the annual henbane were equal in alkaloidal value to those of the biennial plant.

The following circumstance, however, altered my views, and has enabled me to present a further note on the subject. Soon after the publication of my paper in the *Pharmaceutical Journal*, I received a letter from Messrs. Evans, Lescher and Webb, stating "We are sending you 4 lbs. of henbane leaves of the kind largely used in Germany, and obtained from Leipsic, which, we believe, is the foreign annual plant; we shall be glad to know the result of your examination of the same." Subsequently, in reply to a note from me, the same firm obtained and forwarded a large sample of French henbane, with the remark, "This is collected in France, and is, we believe, what is there used for medicinal purposes."

The opportunity thus generously afforded determined me to examine these henbanes at the earliest occasion, and compare them as to alkaloidal value with ordinary English varieties. Judging from appearances and other circumstances, the foreign henbanes were at the very least two years old, and might have been more, so to make the comparison as fair and equal as possible, English samples of a not less age were obtained. It is fair to state that although no positive information as to the age of any sample was to be obtained, yet I feel confident in saying that all of them had been collected two years, and one English sample was to my own knowledge three years old; anyhow, all the samples examined may be taken as fairly representative of the henbanes of European commerce.

The following remarks may be useful as giving the general appearance of each sample. The German kind had a rough look, was composed largely of the entire annual plant, root, stem, fruit, and leaves, in various stages of development; with it was mixed about one-fourth its weight of first year's biennial leaves, in some cases with the roots attached; a few grasses and some leaves of unknown plants were intermixed. Its odour was somewhat musty and narcotic, colour dull green. The French variety had a very fair appearance, was entirely the first year's biennial plant, consisting mainly of leaves, but here and there a root was found. Its colour was pale green, and odour mildly narcotic. The English varieties examined were of the two kinds which constitute the bulk of the henbane used in British pharmacy, that is, the second year's biennial tops, the first year's biennial leaves. The first of these were the usual flattish masses of flower and small leaves, forming the helicoid cyme of the plant, collected before the fruit had formed. Its colour was pale green, odour hay like and scarcely narcotic. This is the most highly valued variety of the

drug, commanding the highest price. The second kind was the first year's growth of the biennial plant, consisting of the large leaves of the scape. Its colour was dark green, and odour strongly narcotic. It is worthy of notice that this kind of henbane is sometimes sold as annual, but its large size, hairiness and long petiole enables it to be easily distinguished from the thinner, less hairy, and almost sessile leaves of the annual plant.

The process followed for the extraction of the alkaloids was exactly the same as used in previous investigations; it will be found fully described in the *Year-Book of Pharmacy*, 1890, p. 337. Briefly it is as follows:—A proof spirit extract is made from 1 kilogram of the plant; the alkaloids are freed by ammonia and shaken out with chloroform. The chloroform residue of impure bases is dissolved in pure ether, then shaken out with hydrochloric acid. Again the bases are extracted from the hydrochlorides by ammonia and ether. Finally on evaporation of the ether the basic residue is estimated by a volumetric solution of hydrochloric acid, each c.c. of which neutralizes 0.289 gram of base, which may be either hyoscyamine or atropine; as their basic power is the same no error results. The following table gives the results of the examination in parts per 1,000. It should be remarked that the henbanes were dried over a water-bath until of constant weight.

Whence obtained.	Part used.	Yields of alkaloids from 1,000 parts.
Germany . .	Entire annual herb	·295
France . . .	First year's biennial leaf	·398
England . .	First year's biennial leaf	·390
England . .	Second year's biennial tops . . .	·451

A consideration of the figures shows that the German henbane is of low quality, containing roundly one-fourth less alkaloids than the French and English leaves, and one-third less than the English tops. Considering the rough character of the German sample, and the amount of stem present, the result is not contrary to expectation. Had the specimen consisted entirely of leaves it is certain it would have come out fairly level with the others.

I do not suppose, or even suggest, that this quality of henbane is the kind in common use in Germany, as the care I have seen exercised in that country by pharmacists in the selection and storage of herbs is worthy of emulation. It is, however, a fact

that much of this coarse article is sold and distributed to various parts of the world, presumably for manufacture into preparations the quality of which must be very low.

One important point the above figures appear to show, is that a falling off of the alkaloidal value of the leaves takes place with age; for the specimens examined last year, all of which were freshly selected and carefully dried, gave an average yield of .665 per 1,000, as against .383 from the old leaves now examined. Such a wide difference of yield cannot be altogether attributed to the influence of locality or conditions of growth, for two of the old samples were grown in this country, and one of them analysed three years ago .600 of alkaloids per 1,000; so this is strong evidence that changes detrimental to the quality of the drug must take place with age.

In conclusion, it is worthy of remark that a fresh, bright coloured, well preserved sample of henbane, whether of the annual or biennial kind, can certainly be relied on for yielding good preparations; whereas old or dark-coloured leaves should be avoided, as they are invariably of low quality. It is further gratifying to know that the English grown drug is fully equal in quality to those of the foreign markets.

Mr. Moss said he had been for some time in the habit of examining henbane with the view of determining its alkaloidal value, and in doing so had availed himself of Mr. Gerrard's previous suggestions. He had found one difficulty in carrying out that process. When he came to shake out with ether in the second part of the process he found it almost impossible to get away the whole of the alkaloid. He had shaken it not merely three times but thirteen, and still found traces of alkaloid; no doubt the quantity was very small, but in the aggregate it must affect the result. His result with English biennial henbane was somewhat in excess of that obtained by Mr. Gerrard, which might be due to the extra number of shakings. His figures were a little in excess of .7 per 1,000, whilst Mr. Gerrard gave them as from .6 to .7. With regard to foreign henbane he had also obtained a specimen, which was better than the one now shown; it was green, not so stalky, and not at all musty, and he obtained from it alkaloid corresponding to about .4 per 1,000.

Dr. RIDEAL said he had no experience with regard to henbane, but it appeared to him very misleading to refer to the alkaloidal

strength of plants without stating exactly the conditions of the different samples. It would be interesting to know if Mr. Gerrard had determined the alkaloidal value of the leaves, the stem and the root, with a view to ascertaining the quality of alkaloid from the amount of these different parts present in any particular sample. The result obtained from a German sample in which the root and twig were attached must, he took it, be much lower than from French and English picked samples. He would suggest that Mr. Gerrard might next year give a communication on the alkaloidal strength of the same four samples, which would furnish a conclusive test of the effect of age on strength.

Mr. RANSOM said he had experienced the same difficulty as Mr. Moss had mentioned in the extraction of the alkaloid with ether; he found chloroform more satisfactory, as it took it out more quickly and with the same degree of purity. He understood that last year Mr. Gerrard found the first and second year's leaf practically the same, but this year that the second year's was rather superior to the first.

Mr. J. S. WARD said the remarks he might have made had been largely anticipated by previous speakers. Mr. Gerrard was pre-eminently an authority on henbane, and it was interesting to learn from him that last year he found the first and second year's leaves of the biennial plant were about equal, while this year the second year's leaves were more active, both, however, being much less active than those examined last year. It would be highly interesting if Mr. Gerrard could inform them whether he had examined a portion of the same leaves as those examined last year but probably they were totally different samples. Seeing that they all appeared to diminish in value with age it would be well to know if they did so equally, or if one kind had better keeping properties than another. Another point was as to the two English varieties, whether the alkaloidal value bore any relation to the colour. He believed it was of great importance in drying herbs that they should be dried within certain limits of temperature, and that with plants like this, where some of the constituents were volatile, they were much better if green than when of a dark brown colour.

The PRESIDENT said he gathered that the French and English varieties were practically identical as far as the yield of alkaloid was concerned, but still that only referred to alkaloidal value by titration, which might not be absolutely the same as the yield of crystallizable alkaloid. A large quantity of henbane was brought

to London from Germany, where he believed the leaves of the wild plant were gathered. This year seemed to be a luxurious one for the growth of henbane, for he had lately seen it growing in some profusion in the south of England, and had noticed a collector of simples with a large parcel, and also another of horehound.

Mr. GERRARD said his object had been to show things as they were, it not being in his power to make them as they ought to be. If he could he would have henbane always uniform in quality, so that every one might know exactly what he was using, and have a preparation of definite strength. Mr. Moss and Mr. Ransom had put similar questions, and he might say in answer that he exhausted the extract first with chloroform; he did not start with ether. He was perfectly aware that chloroform was the best alkaloidal solvent, but it was not the best alkaloidal purifier. If the material were extracted with chloroform and the alkaloid removed from the chloroform by shaking with hydrochloric acid, and then treated a second time with ammonia and ether, the alkaloid would be obtained in a state of purity in which it could not be got if it were taken out once for all with chloroform. Chloroform should be used to begin with and ether to finish with. Perhaps one reason why Mr. Moss had not been able to remove quite the whole of his alkaloid—of course it was impossible to do so absolutely—was that ether sometimes contained traces of alcohol, and when such ether was shaken with an aqueous mixture a good deal of such ether went into solution, and so held back the alkaloid. There was always a balance between the solubility of atropine in the ether on the one hand and in the aqueous fluid on the other, and he had endeavoured to overcome that to some extent. If a solution containing a considerable amount of alkaloid were shaken up with ether three or four times there would be left behind a tolerably weak alkaloidal solution; still one would like to get out the whole of the alkaloid present, and what he did as a rule was to make the solution neutral with a weak acid, such as tartaric or citric, evaporate it to a small volume, treat it afresh with ammonia and give it a final shaking with ether; if there were anything worth taking out of the residue that process would remove it. In reply to Dr. Rideal, he must refer him to his paper of last year, in which he showed that the root had a considerably higher value than the leaf at any period of its growth. The value of the stem he had not gone into, because it was not used in pharmacy; he did not suppose there would be anything

worth extracting in a woody substance such as the stem. German henbane, which contained a good deal of this cellulose matter, came out very low in quantity of alkaloid.

Dr. RIDEAL asked if the quantity of alkaloid in the sample of German henbane could not have been estimated from the proportion of stem and root in the parcel.

Mr. GERRARD said it would depend very much on the age. Given a fresh specimen, grown under fair conditions and properly dried, he thought the yield of base from that would be about '39 per 1,000 instead of '29; the low figure was due to the admixture of foreign leaves and the large amount of stem present. With regard to the diminution in value with age, this was his first opportunity of going into that part of the subject. There had long been a suspicion that leaves and drugs which had been kept in bottles for months or years were of little or no value, and it was not unusual to throw them away. He thought there was really good ground for that practice, and when any specimen was at all suspected it was well to reject it and get a fresh one. The colour of a crude drug was some guide, though not an absolute one; but in the case of a leaf, if it had a fresh green colour they knew it must have been collected and dried carefully, and such a leaf would, as a rule, yield an active preparation.

Mr. MOSS said he was glad to have extracted from Mr. Gerrard a very important modification of his process. He had got the alkaloid out of the leaf, but not by merely shaking a few times with ether. He was also glad to find that Mr. Gerrard estimated that a good sample of foreign leaves would yield '39 per 1,000, which was very near his own experience, viz., '4.

The PRESIDENT then moved a vote of thanks to Mr. Gerrard for this addition to a series of papers which were very valuable, and hoped he would continue his investigations, as there was still a good deal to be done.

The vote of thanks was unanimously agreed to.

The next paper read was a—

NOTE ON THE CONSTITUENTS OF HENBANE SEED.

By F. RANSOM, F.C.S.

The presence of an alkaloid in henbane seed appears to have been first noticed by Brandes, and its isolation was effected by

Geiger and Hesse in 1833. It was probably, however, first prepared in a pure state by Höhn and Reichardt in 1872. Ladenburg demonstrated the isomerism of hyoscyamine with atropine in 1880, and contributed largely to our knowledge of the composition and chemical properties of the alkaloid. He also found hyoscyne, another isomeric alkaloid, to be present. Various statements have been made as to the amount of alkaloid present in the seed, which is usually considered to be the most active part of the plant, and has been suggested for use in galenical preparations. Thorey finds '08 to '16 per cent. in the dried seed, while the authors of the *Pharmacographia* state that only '05 per cent. is present. With a view to ascertain the actual alkaloidal value I have endeavoured to devise a process for estimation. Considerable difficulty has been encountered owing to the large amount of fixed oil present, which interferes with the rapid exhaustion of the seed by usual solvents. It has been suggested to remove the oil before extracting the alkaloid, but this is found to be undesirable in a process of estimation, as the alkaloid itself is to some extent soluble in the oil. It was found, however, that by long-continued percolation with ordinary methylated spirit (64 per cent. over proof) complete exhaustion could at length be obtained. The alcohol was then evaporated from the percolate at a temperature not exceeding 78° C., and on cooling the oil separated from the residual extract. The oil was decanted and washed with water acidulated with hydrochloric acid. The extract was dissolved in warmed acidulated water, and the washings added. The solution was then rendered slightly alkaline with ammonia and exhausted by agitation with chloroform. After separation the alkaloid was removed from the chloroform solution by agitation with very dilute hydrochloric acid, the acid solution was rendered alkaline with ammonia, and the alkaloid finally extracted with chloroform. The chloroform solution, allowed to evaporate spontaneously, left a very slightly coloured crystalline residue. To determine the alkaloidal purity of this residue, weighing when dried in a desiccator '05 gram, it was dissolved in very dilute hydrochloric acid and precipitated with a solution of iodine in iodide of potassium. The precipitate was collected on a filter, washed and dissolved in a solution of sodium hyposulphite, in which it was entirely soluble. Ammonia was added to the solution and the alkaloid extracted with chloroform, which on spontaneous evaporation left a crystalline residue weighing when dried in a desiccator '0495 gram., and thus indicating the purity of the original residue.

For the process of estimation 150 grams of the finely-powdered seed were treated by the method described above, and yielded a residue which, when dried at 100° C. weighed .0805 gram, or .054 per cent. A specimen of the same seed was afterwards carefully dried, and found to contain 7 per cent. of water. A correction is therefore necessary, and the percentage of alkaloid in the dried seed may be taken as .058. This is slightly below the total alkaloid found in the dried leaf by Gerrard, as stated in a paper read at a sitting of this Conference at Leeds last year.

The fixed oil was estimated and found to be present to the extent of 18.8 per cent. in the dried seed. It is dark olive-brown in colour, and has a specific gravity of .935. It is soluble in ether, chloroform, absolute alcohol, petroleum ether, and benzene.

The seeds experimented upon were obtained from biennial plants of *Hyoscyamus niger* grown at Hitchin.

It would appear from the above results that henbane seed is not so rich in alkaloid as has at times been supposed, and on this account, and from the large amount of fixed oil present, it would not seem desirable to recommend it for galenical preparations.

The PRESIDENT said there was only one point in which the seed had an advantage over the leaf, viz., that it kept better. As Mr. Gerrard had pointed out, the leaves of plants were apt to lose their virtues, and seeds were a little more stable. No doubt they too lost their vitality in time, though cases had been known in which, after being buried for centuries at the base of an old Roman wall, they had germinated.

Mr. GERRARD asked whether Mr. Ransom had worked upon commercial seeds or upon selected ones. He put the question because he knew that many henbane seeds did not really ripen, and had not completed their development, though when the fruit was dried and the seeds were shaken out they would appear to the ordinary observer to be ripe. No doubt the bulk of seeds in commerce consisted of such mixed seeds, and if selected seeds, all of which were known to be ripened, were employed, a higher alkaloidal value would be obtained. He should like to know if any peculiar odour was observed to belong to the fatty matter separated from the seeds. Some years ago, when working with a large quantity of leaf, he was surprised to find that in a portion which had been set aside a butyric compound was developed, which was found to be a butyric ether. It might have been formed by a very

slow decomposition after the collection of the leaf, and he should like to know if any similar odour had been noticed in the fat obtained from the seeds.

Mr. DOTT asked if the fixed oil contained any alkaloid. It was always very troublesome to extract the alkaloid from the seed.

Mr. J. C. UMNEY said he had found a difficulty in extracting the alkaloid from stavesacre; in that case he found the solubility of alkaloid in the oil was as great as $1\frac{1}{2}$ to 2 per cent.

The PRESIDENT asked if the alkaloid was soluble in the oil when pressed out.

Mr. UMNEY: Either pressed out or extracted with ether.

The PRESIDENT said he understood that in Germany most of the alkaloid was manufactured from seed, and no doubt the Germans adopted the cheapest source. Probably the seed was treated by some means to get rid of the oil before extracting the alkaloid.

Mr. PETER MACEWAN asked if there was not a tradition that German henbane seed was kiln dried.

The PRESIDENT thought it was more a tradition than anything else; but the reason generally assigned was to prevent the seed being used in England for growing the plant.

Mr. RANSOM said the seed he had examined was a fair example of English grown seeds; probably the greater amount of commercial seed was foreign, and that he had not dealt with. He had not noticed any odorous principle in the seeds, though he had in the leaf. The oil did dissolve the alkaloid, and therefore by extracting the oil first and not taking account of it some alkaloid was lost.

The Conference then adjourned until the next day.

Wednesday, August 19th, 1891.

The President took the chair at 10 o'clock, and the proceedings commenced with the reading of a paper, entitled—

GLACIAL PHOSPHORIC ACID,

By JOHN HODGKIN, F.L.S., F.I.C., F.C.S.

A sample of glacial phosphoric acid was recently brought under my notice by an American correspondent, which was stated to be the quality usually imported from Europe for his market. An analysis was made, and revealed large quantities of sodium; it, therefore, became a matter of some interest to collect and analyse a few samples, both English and foreign, in order to see what was

being ordinarily sold as "glacial phosphoric acid." A few remarks as to what this acid is, and how it is directed to be made, will be of assistance. When a solution of orthophosphoric acid, such as the syrupy phosphoric acid, 1·750, used in pharmacy, is evaporated under proper conditions, most of the water is driven off, and the sticky, viscous mass, consisting chiefly of metaphosphoric acid, remains, $\text{H}_3\text{P O}_4 = \text{H P O}_3 + \text{H}_2\text{O}$. This product is, however, not one that can be conveniently or readily dealt with, as it is extremely deliquescent, and is not in such a form as to permit of its ready manipulation. It was afterwards prepared by calcining phosphate of ammonia, the supposition being that the ammonia would all be expelled at a red heat. The process as given by Parrish (*Treatise on Pharmacy*, 1885, p. 204) is practically that given in most handbooks, and is as follows:—"It is made from calcined bones by decomposing them with sulphuric acid, by which process a superphosphate of lime is produced. The superphosphate is neutralized by carbonate of ammonium, which generates phosphate of ammonium in solution with precipitation of carbonate of calcium. By calcining phosphate of ammonium at a red heat, the volatile ingredient is expelled and the solid H P O_3 remains."

He further adds: "This acid is no longer officinal in the United States Pharmacopœia; that which has been in the market for some years past has been largely adulterated with phosphate of sodium or phosphate of ammonium."

For the purposes of comparison, I have prepared a sample of glacial phosphoric acid from phosphate of ammonia, which I have marked A; B, and C, are English makes; D is German, in lumps; E, the same maker's production in sticks; F is the American sample already referred to; G is an experimental sample deliberately adulterated with phosphate of soda, and H is the product of calcining microcosmic salt, or hydro-ammonio-sodic phosphate.

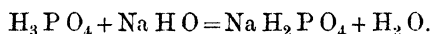
Before discussing the results of the analysis, I should like to make a few remarks as to the method employed. The constituents of importance to be ascertained were as follows:—free hydric metaphosphate, combined metaphosphate, ammonium, sodium, water.

It was a matter of considerable difficulty to devise a process, satisfactory in its results, for estimating the free and combined metaphosphates. Eventually the following method, based upon Thompson's researches on indicators, referred to in Sutton's *Volumetric Analysis*, was adopted, and yielded very satisfactory results.

The sample of glacial acid under examination was, after solution

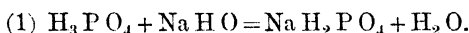
in distilled water, boiled for 1 hour to effect the conversion into orthophosphoric acid; $\text{HPO}_3 + \text{H}_2\text{O} = \text{H}_3\text{PO}_4$.

This does not take place readily, as has been stated, and therefore prolonged boiling is essential. This solution is made up to a given bulk (10 per cent. is a convenient strength), and then 25 c.c. of this is titrated directly with normal NaHO solution, using 1 drop of dilute *Methyl-orange* as an indicator, the reaction point being the sharp change from faint pink to an almost imperceptible lemon yellow. The number of c.c. used is noted, each c.c. being equivalent to 0.08 grm. HPO_3 . The reaction that takes place is as follows:—

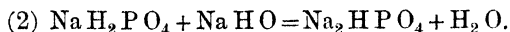


Now whilst this dihydrosodic phosphate is *neutral* to methyl-orange, it is *acid* to Phenolphthalein, so that by this means, using this latter indicator, we can volumetrically determine the amount of *combined* acid.

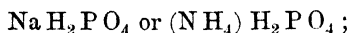
To the *same* solution, now almost colourless, add 1 drop of alcoholic phenolphthalein, and continue to run in NaHO solution until the reaction point, which is a sudden change to a pink or crimson tint, is reached. The number of c.c. used is noted. We have now data for calculating the free and combined acid; the first reading with methyl-orange shows the free acid; the latter, with phenolphthalein, shows the total acid, free and combined. The reactions are:—



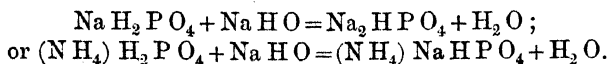
Then this NaH_2PO_4 is converted by the addition of NaHO into the hydrodisodic phosphate, which is neutral to phenolphthalein:—



But in addition, in all the samples examined there was a certain percentage of base present, either sodium or ammonium, and as this co-existed with an *excess* of free acid, it could *only* have been present as—

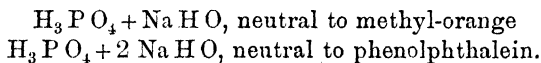


neither of which are indicated by methyl-orange, as they are *neutral* to it, but both are readily shown by phenolphthalein since they are *acid* to it. To the above reactions we must therefore add—



So that if we subtract from the total number of c.c. NaHO used,

the amount required to convert the H_3PO_4 into Na_2HPO_4 , we obtain the number of c.c. required to convert the combined phosphate into Na_2HPO_4 . The amount is twice the number of c.c. shown by the methyl-orange, since it takes *two* equivalents of NaHO to form the Na_2HPO_4 , whereas the methyl-orange reading shows only *one* equivalent—



For example: supposing it took 8 c.c. to reach the methyl-orange reaction point, then $8 \text{ c.c.} \times .08$ would indicate the percentage of HPO_3 originally present in the *free* state. On adding phenolphthalein, and again running in NaHO , suppose the reaction point to be 20 c.c., then $20 - (2 \times 8) = 4 \text{ c.c.} \times 0.08$ would be the combined HPO_3 originally present. Supposing there had been no *combined* acid, the reaction point would have been 16 c.c., *i.e.*, another independent measure of the H_3PO_4 . The phenolphthalein reaction, of course, gives the same reading for free H_3PO_4 as the methyl-orange, the factors being, in the former case, $1 \text{ c.c.} = 0.04 \text{ HPO}_3$; in the latter, $1 \text{ c.c.} = 0.08 \text{ HPO}_3$. These factors are for metaphosphoric acid HPO_3 values; for orthophosphoric acid H_3PO_4 , they would have to be expanded.

These reactions are extremely simple and accurate, the only necessity is that the conversion of the metaphosphoric acid into the orthophosphoric acid should have been complete; since, whilst metaphosphoric acid reacts directly with methyl-orange, with phenolphthalein there is no definite reaction.

The conversion is rendered certain by boiling the sample for ten minutes with a small definite amount of normal H_2SO_4 , of course in each case subtracting the same amount of normal soda from each titration result. This boiling must take place in a flask with inverted funnel to prevent loss by spirting, and sulphuric acid must be used, since other acids would lose by their volatility.

The results obtained by this method were carefully checked against the uranium method, which, of course, only shows the *total* phosphate, free and combined, and does not discriminate as this method does.

Another point in favour of this method is that it shows the *available* HPO_3 , at once, since this acid reacts directly with methyl-orange and NaHO , so that to determine free acidity no boiling is required. All that is necessary is to dissolve the sample.

in water and titrate with normal soda, 1 c.c. = 0.08 H P O_3 , the results before and after boiling being identical.

The *Ammonia* was estimated by distilling with an excess of soda into decinormal acid, and titrating with methyl-orange.

The *Soda* was estimated as sodium chloride by Bettendorf's method (*Zeitschrift für analytische Chemie*, 1888, p. 24), which consists in placing 3 to 4 grams of the glacial acid into 50 c.c. of fuming hydrochloric acid, sp. gr. 1.190, and allowing the mixture to stand for 24 hours. Filter the resulting Na Cl through spongy platinum, and wash several times with fuming hydrochloric acid, ignite and weigh. The solubility of the sodium chloride in the fuming acid is 1 part by weight in 1,348 parts of the acid, of a sp. gr. of 1.190.

The accompanying table shows the results obtained.

Glacial Phosphoric Acid.

Sample.	Origin.	Form.	Free HPO_3	Combined HPO_3	Equal to $-\text{PO}_3$	Total HPO_3	Total by Uranium.	Total Base	Ammonium.	Sodium.	Equal to Na_2O & PO_3 in 12 aq.	Water.	Silica.	Arsenic.	Total.
A	Made by the ammonia process.	Lump	48.00	43.52	42.98	91.52	91.84	8.05	8.05	None.	—	Tr.	0.54	Tr.	99.57
B	English	"	52.80	40.00	39.50	92.80	93.14	7.82	6.48	1.34	10.44	"	—	0.08	100.20
C	"	"	46.08	39.36	38.87	85.44	85.40	9.79	0.07	9.72	75.63	5.60	—	Tr.	100.34
D	German	"	31.68	52.80	52.14	84.48	84.98	14.00	0.05	14.04	109.30	2.40	—	"	100.31
E	"	Sticks	36.48	47.36	46.77	83.84	83.70	13.49	0.06	13.43	104.48	3.25	—	"	100.00
F	Europ'n*	Lump	42.21	37.89	37.41	80.10	80.41	10.20	none.	10.20	79.30	10.10	—	"	99.92
G	Experimental.	"	44.16	46.72	46.14	90.88	90.65	10.10	4.87	5.23	40.67	Tr.	—	"	100.40
H	Do. from microcosmic salt.	"	none	—	—	—	78.12	22.50	—	22.50	—	—	—	—	99.70

* F is the sample referred to as sent from America and being of European origin.

Sample A is in bright colourless lumps and is to a certain extent deliquescent. It was prepared from syrupy phosphoric acid, 1.750, and ammonia. The analysis shows that it is impossible to drive off all the ammonia, the amount left in being equal to 8.05 per cent. ammonia. It contained a small quantity of silica, which was originally present in the phosphoric acid employed. The free H P O_3 is 48 per cent; the combined, as $-\text{P O}_3$, 42.98 per cent.: or total acid, as H P O_3 , 91.52 per cent.

Sample B was of English make, in colourless lumps, but not nearly so bright as A, and somewhat deliquescent. It will be noticed that both soda and ammonia are present, the total base being 7.82 per cent. against 8.05 per cent. in A. The free H P O_3

is 52.80 per cent.; the combined acid, $-P O_3$, 39.5, or total acid, as $H P O_3$, 92.80 per cent, against 91.52 per cent. in A. This sample contains arsenic to the extent of 0.08 per cent., probably due to the phosphoric acid employed and not having been properly prepared.

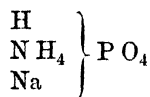
Sample C.—English, in white lumps; portions slightly opaque; hard and only slightly deliquescent. Effloresces rapidly if exposed to the air. The total acid is now diminishing in quantity, whilst the base, now practically soda, is increasing. The sodium present in the sample is equivalent to 75.63 per cent. of ordinary hydrodisodic phosphate; *e.g.*, every pound of this glacial acid contains sodium equal to $\frac{3}{4}$ lb. of phosphate of soda. It also contains over 5 per cent of water.

Sample D.—German; in lumps with a pink tint; very hard and very slightly deliquescent. The free acid is now considerably diminished, being only 31.68 per cent. The total base is no less than 14 per cent., being equivalent to over 109 per cent. phosphate of soda. Water is also present.

Sample E.—German, *in sticks*, bright white, very hard and very slightly deliquescent. The amount of free $H P O_3$ in this sample is greater than that in the "lump" of the same maker. The ammonia is about the same, the soda a little less, but there is more water.

Sample F is the sample referred to by my American correspondent. When received it was partially effloresced, but eventually it deliquesced. It was therefore dried at about $160^{\circ} C$. and then analysed, when it gave about 10 per cent. of water. Probably as sent out from the makers it was not very different from Sample C.

Sample G is an experiment to note the effect of the addition of phosphate of soda to a phosphate of ammonia liquor, and then calcining. The result is curious, as nearly 5 per cent. of ammonium is retained, whilst in the next *Sample H*, made from microcosmic salt,



all the ammonium is expelled and pure metaphosphate of soda $(Na P O_3)_n$ is the result, giving a glass-hard nondeliquescent product.

To sum up the results:—Taking A as the standard, B is on the whole the best acid, but should not contain arsenic to such an

extent as to allow of its being estimated. This, however, is probably due to careless selection of phosphoric acid.

The *free* acid is somewhat greater than that in A, the *total* acid being close, as is also the amount of the total base, being 8.05 per cent. in A and 7.82 per cent. in B. This slight addition of soda seems to increase materially the *hardness*, though whether that is sufficient to gain to excuse the adulteration, and to overcome the disadvantage of having a fixed instead of a volatile base, must be a question for others to decide.

In C, D, E and F, sodium is being freely added, the percentages when worked out to ordinary hydrodisodic phosphate being respectively

C.	D.	E.	F.
75.63	109.3	104.48	79.30.

Water is present in these samples containing much soda, in estimating which it was noticed that part was easily got rid of, whilst the remainder was only expelled with great difficulty: possibly this water is attached to the sodium phosphate.

In the lump acids the introduction of sodium is in my opinion a distinct adulteration, and is unnecessary, and as far as I can find is not given in any of the methods for making glacial phosphoric acid. As regards the *stick acid*, soda is added to render the sticks permanent, as if made from the pure glacial acid by ammonia, they will not retain their form. Surely from the consumer's point of view it must be a very questionable advantage to buy or use such an acid, when it must of necessity be accompanied by such large percentages of undesirable and extraneous matter.

In conclusion, I would urge pharmacists and others who use glacial phosphoric acid not to use the "stick" form at any price, and to insist that the "lump" shall be soda free, and made by the ammonia process. Bettendorf's method, described above, is a ready means for detecting qualitatively (and quantitatively, if desired) whether sodium is present. This test should be rigorously applied, and samples which give sodium chloride should be condemned, each 1 per cent. of sodium found meaning 7 to 8 per cent. of phosphate of soda. Silica, if in large quantity, would be shown here, but as this is insoluble in water, no mistakes need arise on that score; whilst as a check upon the percentage of free acidity being kept up, a simple titration with standard soda and methyl-orange affords a ready indication. Phosphate of ammonia is not likely to be used as an adulterant, and if present in large quantity it can only be through imperfect calcination.

The PRESIDENT said the Conference was much obliged to Mr. Hodgkin for this interesting communication, in which he had clearly pointed out what the glacial phosphoric acid of commerce consisted of. He knew that if it were made from phosphate of ammonia it always contained traces of ammonia. It was impossible to prepare it from pure phosphoric acid, because made in that way it was too deliquescent for commercial purposes. It was probably impossible to get it free from traces of iron; but he was surprised to find that traces of arsenic were found in nearly every sample. He thought it was now possible to obtain phosphorus free from arsenic.

Mr. HODGKIN said that it was so, but as a matter of fact all these samples did contain traces of arsenic, and one more than a trace.

The PRESIDENT added that the mode of distinguishing between that containing soda, which if more than a trace was an adulteration, and that which did not, would be very useful.

Mr. THOS. TYRER said his experience with regard to phosphoric acid was so recent that he could not be considered an expert, but he had made some careful investigations into the subject, and the general conclusions to which he had come agreed in the main with those of Mr. Hodgkin. Whilst accepting absolutely the position Hodgkin had taken up, he took it the chief value of the paper would not be so much the analyses, which were a demonstration to those who understood them, but the exposition of the methods by which pharmacists with any pretensions to manipulative skill could determine for themselves whether they had phosphoric acid worthy of the name or not. On the other hand, and as a matter of ethics, it must not be forgotten that while it was extremely desirable and in fact one's duty to supply the article asked for, yet as in two cases mentioned on the previous day (one milk of sulphur, and the other euonymin, with or without sulphate of barium or magnesia), so one had in the case of phosphoric acid certain substances added for the purpose of securing a certain physical state. In the one case something was added to prevent the too great absorption of moisture; in this case the only justification for the addition was to produce a certain trade or technical appearance. While elegant pharmacy was recognised as an undoubted desideratum both from the manufacturer's and dispenser's point of view, he presumed no one would say that conditions of purity so far as they could be obtained were not to be insisted on. If that were accepted it would follow that people must give up

asking for phosphoric acid in any particular form, or if they did they must be prepared to find it, as in the case of euonymin when it got abroad, a mass which was not very definite or tangible to deal with. Accepting these considerations, he agreed that the time had come when manufacturers of glacial phosphoric acid in this country should adopt a form which they could substantiate chemically, and which in its viscous physical condition was not nasty or unpresentable. It was perfectly clear that the publication of this paper and the discussion upon it would tend to put pharmacists in the right position with regard to this article. He must confess that the presence of arsenic was a surprise to him, but the fact was one often did not look for what one did not expect to find, and it was evident that this was not always safe. But considering the enormous amount of concentration that had taken place in the acid, and that only traces were found, it was evident that the contamination was not serious, and in a solution it would scarcely be found at all. It was an axiom with him that if one wanted to make a pure article one must begin by having pure materials; the way to keep out impurities was to take care not to have them at the beginning. With regard to the particular methods of analysis described, he had been a little curious to know how the point was hit between the two indicators, knowing the difficulty there was in other quantitative tests where one indicator was followed by another; there was a point between the two, except under perfectly understood conditions, where there was a loss. But that was perfectly cleared up, and he had no doubt of the absolute reliability of the method; the diagram was quite convincing on that point. Mr. Hodgkin was to be congratulated on the paper, and pharmacists and manufacturers were much indebted to him.

Mr. A. H. ALLEN asked if any traces of platinum had been found in any of these products. A good many years ago, when making experiments on glass, he found that glacial phosphoric acid dissolved not only glass but platinum also, and seeing that this acid had been concentrated in platinum, he should like to know if any of that metal had been found, or if it had been tested for.

Mr. TYRER said it was matter of common knowledge that his predecessor had his platinum dishes stolen, and one of the many peculiarities of the case was that though these dishes had been in use for twenty-five years, portions of them were identified by Messrs. Johnson and Matthey, he believed by their mechanical

structure, certain portions being thinner in one part than another, indicating that the metal had been wrought. Calculations were made of the relation of the piece examined to the area of the whole dish, and it was found that the loss was inappreciable after that long period of wear and tear. He held one of the proofs of identity, meeting the statement that the platinum could not have been used in the concentration of phosphoric acid, was the discovery by Mr. Bernard Dyer, the chemist engaged in the case, of distinct traces of meta-phosphoric acid on the internal surface. He had some specimens of phosphoric acid, the remnants of many years, which he had examined for every possible impurity, including arsenic, which he did not find, and he certainly did not find platinum, though he found a trace of manganese. He found that iron too gave in a small experimental evaporation just the same result as that obtained by Mr. Hodgkin, but he found no platinum. He had been anxious to know if anything else would answer the purpose, the platinum having disappeared; therefore he tried everything, but no glass of English manufacture would resist the action of concentrating phosphoric acid, even dilute, nor would any porcelain dish, crucible, or glass of any kind. In fact, when phosphoric acid was concentrated to a condition in which it could be said to be anything like glacial it was astonishing how even the best evaporating dishes, beakers and crucibles became absolutely spoiled by it. The glaze went first, and then there was a most interesting corrugation of the surface.

Mr. ALLEN said he found the dish in which he operated became corroded, and therefore he presumed it was acted on by the phosphoric acid. When he said that phosphoric acid dissolved platinum he did not mean that it exerted a powerful action with effervescence.

Mr. HODGKIN said it was not considered necessary to test for platinum, but he was certain that it was not there. It was quite true that all glazes were attacked by concentrated phosphoric acid, and occasionally samples of foreign acid were met with which contained large quantities of silica, and which clearly had been evaporated in porcelain or earthenware vessels. Platinum was the only thing which could properly be used. As shown by the analyses the amount of sodium necessary to add to obtain a fairly hard sample was only 1.34 per cent., so that when it mounted up to 10 per cent. or more, it might be taken to be an adulteration. Why he recommended pharmacists to condemn samples containing sodium was that they knew if they had it present, they might

have anything from $1\frac{1}{2}$ up to 13 or 14 per cent. Filtering through spongy platinum, so as to estimate the sodium quantitatively was not very easy, but the method given was quite sufficient to show qualitatively the presence of sodium as sodium chloride. The moral was that glacial phosphoric acid ought not to be used at all for ordinary purposes; it was really an antiquated form which ought to be relegated to the limbo of exploded notions; but if used at all it should be free from sodium. As regards arsenic Mr. Tyrer was quite right; he did not emphasise the word traces, and there were only traces; and considering the amount of concentration it was not surprising that they should be found.

The PRESIDENT then moved a vote of thanks to Mr. Hodgkin, saying he agreed with him that glacial phosphoric acid should be relegated to the same limbo as calcareous milk of sulphur.

The vote of thanks was unanimously agreed to.

The next paper read was a—

NOTE ON A PROPOSED METHOD OF STANDARDIZING THE EXTRACTS OF NUX VOMICA AND OPIUM.

By MICHAEL CONROY, F.C.S.

Only the extracts of nux vomica and of opium are referred to in this note, because they are the only two solid extracts of the British Pharmacopœia that are made of a standard alkaloidal strength. As, however, the art of pharmacy is becoming daily more exact, it is quite possible that our next Pharmacopœia may contain several others, such as the extracts of belladonna, calabar bean, colchicum, henbane and hemlock. It is therefore of great importance that some method be adopted whereby standardized extracts may be kept of a uniform consistence instead of being more liquid or solid at one time than another.

It is, I think, generally admitted that the present mode of standardizing the extracts of nux vomica and opium is unsatisfactory. In the case of nux vomica we are directed to estimate the total alkaloid in one fluid ounce of the percolate. Having ascertained this we next take as much of the percolate as contains $131\frac{1}{4}$ grains of total alkaloid, and by distillation and evaporation reduce it to an exact weight of two ounces. This gives an extract containing 15 per cent. of total alkaloid, but which, as a rule, is

far too thin for forming pills. Another important consideration is that an extract of this thin consistence, under certain conditions of storage, is very prone to dry up and so increase in alkaloidal strength as to become a source of danger.

The difficulty that presents itself is that the yields of alkaloid and extractive matter are not always proportionate. One parcel of nux vomica may be rich in alkaloid and poor in extractive matter, in which case we are bound to have a thin extract by our present method, whilst another parcel may be poor in alkaloid and rich in extractive, the result being a more solid extract, but in no case have I met with nux vomica yielding a sufficiently solid extract, when standardized to 15 per cent. of alkaloid. I quite recognise the difficulty of fixing an alkaloidal standard for this or for any other extract, and do not wish to infer that the standard has in this case been fixed too low. It is absolutely necessary in fixing a standard to be rather below than above the average, and in consideration of this I quite think that 15 per cent. total alkaloidal strength is a fair one for nux vomica extract.

In the case of extract of opium the morphine strength of 20 per cent. is undoubtedly too low, the consequence being that the extract is always too soft if fine opium has been used. I do not overlook the fact that the official opium when dried at 212° F. and powdered should contain about 10 per cent. of morphine, or, as stated in the official language, that "100 parts of such dry powdered opium shall yield not less than 9·5 parts, and not more than 10·5 parts of morphine." If genuine Asia Minor opium of this strength could be obtained, and bearing in mind that opium yields about 50 per cent. of extractive, there would be very little difficulty in producing a fairly good extract containing about 20 per cent. of alkaloid. Such, however, is not the case. It is practically impossible to obtain genuine Asia Minor opium, the kind directed by the Pharmacopœia, of this low alkaloidal strength. Good Asia Minor opium when dried and powdered as directed yields from 13 to 15 per cent. of morphine by the official test, and I speak from considerable practical experience in opium assaying when I say that the standard of the dry powdered drug should be *at least* 12½ per cent., instead of 10 per cent. as now. Owing to the low standard fixed for this drug, all our official preparations of opium are 20 per cent. too weak, and our extract is not of a suitable consistence for forming pills.

Now bearing in mind that extracts keep better and are much better adapted for pill making, which after all is their chief use,

when made of a good firm consistence, and seeing that it is necessary to take a low average alkaloidal standard, I would recommend the adoption of the following method with the view of keeping them up to a uniformly firm consistence.

Exhaust the drug as usual, but instead of evaporating to a certain weight, evaporate until the extract is of a suitable pilular consistence. Then test the alkaloidal strength and make up to the correct standard by the addition of glucose.

Glucose or starch sugar is not at present used in pharmacy, but it is largely used in confectionery and in the manufacture of liqueurs and cordials. There are several commercial varieties, but the one referred to here is the kind known as liquid glucose. It is a colourless, sweetish, transparent, semi-solid body, without any special tendency to become dry or to absorb moisture when exposed to atmospheric influences. Adding to these qualities that it is quite innocuous, and that it blends well with these and other extracts with which I have experimented, I consider it a most suitable substance for the purpose.

Samples of extracts standardized as described are on the table for inspection, together with a sample of the glucose used.

Mr. DOTT said that it was practically impossible to get an opium which would yield an extract having the official percentage of morphia. The usual method of reducing opium by the addition of dried marc, or some such substance, of course would not affect the morphia strength of the extract. He thought the addition of glucose might be useful.

Mr. SHORT said he had made various experiments on *nux vomica* preparations and extracts, and he agreed with Mr. Conroy that in a large number of cases the extract when reduced to the strength of 15 per cent. of alkaloid was rather soft; on the other hand, with some other specimens, it was of a medium consistence at that strength, and if any higher standard were adopted it would be inconveniently hard. The only way he saw out of the difficulty was that proposed by Mr. Conroy, of adding something to an extract which would otherwise be too soft. There was a strong feeling against adding anything not contained in the drug itself in preparing an extract, but he could see no harm in adding a substance like glucose. It must be borne in mind that the tincture had to be made from the extract, and therefore something must be used which would be soluble in the alcohol of the tincture and

glucose in the small quantity required, would be perfectly soluble in alcohol of the usual strength employed—4 of rectified spirit to 1 of water.

Mr. J. C. UMNEY said he had found a very convenient method of making the extract harder when too soft was to percolate the marc afterwards with very dilute alcohol and so get out more extractive, and harden the extract with that. Nothing was then introduced which did not actually exist in the drug.

Mr. J. BARCLAY suggested exhausting the opium first with cold water of all its alkaloid and then exhausting the marc with hot water, which took out a great deal of the extractive. The first extract having been assayed could be reduced in strength by the extractive matter made with the hot water.

Mr. GROSE said this paper would be of great interest to retail pharmacists and pill makers. The consistence was not so important to his mind because extract of *nux vomica* or opium was ordered in small quantities in pills, and it could be generally combined with something to make a firm pill; but if one had three grains extract of belladonna or hyoscyamus to put into a pill, a considerable quantity of excipient had to be added to make it of pilular consistence. He thought the wholesale houses, on whom many retail pharmacists had to depend, were much to blame in selling their customers so much water. Many of the extracts were far from being of a pilular consistence.

Mr. MOSS thought Mr. Grose's remarks showed the advantage which the dispenser had over the manufacturer in dealing with extracts. He had arrived independently at the same method of making extract of *nux vomica* pretty uniform and at the same time of fairly good consistence as Mr. Umney. With regard to extract of opium, making it a little at a time, there was a difficulty in getting any single specimen of opium which would give an extract of the right strength, but by adjusting the proportions of good opium, rich in extractive, such as Malasian, and another kind which came from some other part of Asia Minor, which did not yield so much extractive and was also poor in morphia, you could, by assaying the opiums beforehand, arrive at a mixture which would yield an extract answering to the Pharmacopœia requirements. Of all the things proposed glucose appeared to be the least objectionable; it was so much of the nature of what was found in the drugs themselves that it appeared to be almost the natural article.

Mr. BURROUGHS suggested that it would be better to raise the standard of alkaloid.

Mr. SOUTHALL thought the suggestion just made a very good one. They wanted to harden the extract, not to soften it, which he thought would be the effect of adding glucose; and it was objectionable to add any foreign body at all.

The PRESIDENT pointed out that when the standard in the Pharmacopœia was fixed, opium was at a very high price, but now that it was much cheaper it might be as well to raise the standard. He saw objections to the use of glucose to bring down the extract to the Pharmacopœia standard, as the pills would probably lose their shape, and he should prefer for that reason to use the much-abused sugar of milk. In making extract of opium they wanted to free the drug from some of its constituents which were noxious, and he thought the use of hot water to dissolve out more of some inert substance would be very detrimental, as it also would dissolve out the narcotine, which was best left behind. The cold water extract was a better preparation, and the real object in having an aqueous extract was to be free from several constituents which were detrimental. With regard to nux vomica, the suggestion of Mr. Umney and Mr. Moss appeared to be about the best; viz., to use a somewhat weaker spirituous menstruum, one almost aqueous, for the purpose of getting more extractive, and which upon evaporation would yield a solid substance suitable for diluting a too strong spirituous extract.

Mr. CONROY, in reply, said he had tried using a weaker menstruum for nux vomica, but did not find it very satisfactory, and thought the use of glucose far preferable. He was surprised at Mr. Barclay's remarks, for it was a most peculiar proceeding to exhaust the opium with hot water and then use the product to dilute the extract, into which it would introduce a lot of insoluble matter.

The next paper read was entitled—

SUGGESTIONS FOR THE ASSAY OF ACONITE AND ITS PREPARATIONS.

BY ALFRED H. ALLEN, F.I.C., F.C.S.

The importance attaching to the assay and standardizing of preparations of aconite is universally admitted, but the exceptional difficulties connected with the problem have hitherto prevented any satisfactory solution. That these difficulties are very great is unquestionable, and my proposals must be regarded rather in the

light of suggestions, which may assist other workers in solving the problem, than as a claim to have succeeded in its solution. The extraction of the total alkaloids from aconite root can be effected with tolerable ease, and by the use of judiciously chosen methods they can be isolated fairly pure and without having undergone any material change. The recent paper, by Messrs. Farr and Wright (*Pharm. Journ.* [3], xxi. 1037), is a valuable contribution to this part of the subject; but, as is fully recognised by these chemists, the determination of the total alkaloids of an aconite preparation is in itself of limited value as a criterion of its activity. It is rather the first step in the process of assay, the potency of the preparation substantially depending on the results subsequently obtained.

Where the amount of material is sufficient, there is no doubt that it is very desirable to isolate the crystallizable alkaloid, and if this could be effected with an approach to quantitative accuracy, it would probably furnish the most reliable criterion of the physiological activity of the substance. In practice, however, very great difficulties attend such a method of examination. In the first place, there is always a danger that the maximum yield of crystals may not be obtained, and hence that the activity of the preparation will be seriously under-estimated. But apart from this source of error there exists the grave difficulty that the amount of substance which is commonly available, or can be conveniently submitted to examination, yields a quantity of total alkaloids far too small to render any method based on crystallization practically available.

Under these circumstances, I have, with the assistance of Mr. G. E. Scott-Smith, recently made some experiments to ascertain how far a method based on the saponification of the crystallizable alkaloids could be applied to the very small quantities of material isolated in an ordinary assay. That the saponification occurs with a near approach to quantitative accuracy was clearly established by C. R. Alder Wright, who also proposed to apply the reaction to the actual assay of aconite alkaloids (*Year-Book*, 1877, p. 463). Hence I have thought it unnecessary to repeat Wright's classical experiments, and have sought rather to adapt his researches to the particular object in question, namely, the examination of very small quantities of aconite alkaloids.

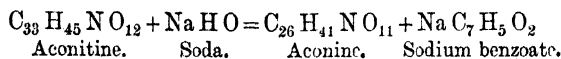
The following table represents the composition of the three principal saponifiable alkaloids of aconite, and shows the products of their saponification. The table is substantially founded on the

researches of C. R. Alder Wright, but the number of atoms of hydrogen in the formulæ of aconitine and aconine has been increased in each case by two, in accordance with the recent researches of Dunstan and Ince, though it is still an open question whether their formulæ or those of Wright express the true composition of the alkaloids in question.

A method of assay based on the saponification of the crystallizable alkaloids has the great merit of distinguishing sharply between the three principal poisonous aconite bases, on the one hand, and the comparatively inactive products of their decomposition on the other. In fact, as it is generally accepted that aconine has only $\frac{1}{300}$ of the physiological activity of aconitine, and that japaconine and pseudaconine bear a similar relation to their respective parent alkaloids, it may be safely assumed that the activity of a mixture of aconite alkaloids is substantially represented by the proportion of saponifiable base present, and therefore if the latter can be ascertained with an approach to quantitative accuracy, a considerable advance will have been made towards the solution of the problem of the assay of aconite preparations.

Crystallizable Alkaloid.		Products of Saponification.					
		Acid Product.				Basic Product.	
Name.	Formula.	Name.	Formula.	Yield.	Na HO required.	Name	Formula.
Aconitine (from <i>A. Napellus</i>).	$C_{33}H_{45}NO_{12}$	Benzoic acid	$C_7H_5O_2$	18.92	6.20	Aconine	$C_{29}H_{41}NO_{11}$
Japaconitine (from <i>A. Fischeri</i> , etc.).	$C_{35}H_{49}N_2O_{21}$	Benzoic acid	$C_7H_5O_2$	19.60	6.43	Japac- onine	$C_{29}H_{41}NO_{10}$
Pseudaconi- tine (from <i>A. ferox</i> . . .	$C_{36}H_{49}NO_{12}$	Veratric acid (Dimethyl- protocate- chuic acid)	$C_9H_{10}O_4$	26.49	5.82	Pseudac- onine	$C_{27}H_{41}NO_9$

As already stated, C. R. A. Wright's researches long ago established the quantitative accuracy with which the saponification of the aconite bases occurred. Thus the reaction of aconitine with caustic soda is expressed as follows:—



The saponification of japaconitine and pseudaconitine may be expressed by similar equations, bearing in mind that the former alkaloid reacts with 2NaHO with formation of two molecules of sodium benzoate and two of japaconine.

Wright's saponification experiments were made on comparatively large quantities of alkaloids, but to be of practical value the method of assay must be available with a quantity of aconite bases not exceeding 50 milligrammes,¹ and should even be applicable with half that quantity, or less than $\frac{1}{10}$ of a grain. I may fairly claim to have achieved a certain amount of success in dealing with these small quantities, a success which is in great measure due to the use of two most valuable reagents, neither of which had come into use at the period of Wright's researches. I refer to methyl-orange and phenolphthalein, the value of which as indicators is even now far from being fully recognised. Methyl-orange is sensitive only to the stronger acids, but reacts with the weakest bases. Hence all the ordinary alkaloids may be titrated with accuracy by its aid. Phenolphthalein, on the other hand, is sensitive to the weakest acids, but is quite unacted on by the majority of the alkaloids; atropine, homatropine, hyoscyne and hyoscyamine being the most notable exceptions. Sulphate of quinine, hydrochloride of morphine, and hydrochloride of aniline are perfectly neutral to methyl-orange, but react with phenolphthalein just as if the acids were in a free state. As phenolphthalein is sensitive to carbonic acid, no sharp results can be obtained unless the standard alkali used in titrating be quite free from carbonate. This is best ensured by employing baryta water as the standard alkaline solution, and experience has convinced me that this reagent is at least twice as sensitive as the most carefully prepared caustic soda. Either hydrochloric or sulphuric acid is suitable as the standard acid; oxalic acid does not react well with methyl-orange. As very minute quantities of acid and alkali are in question, I have found it necessary to employ very dilute standard solutions. The water used for diluting them must be recently boiled, and rigidly neutral in reaction. The standard solutions I have adopted are of $\frac{1}{10}$ normal strength. Thus the hydrochloric acid contains $\frac{36.5}{50}$ grammes of HCl per litre and the baryta $\frac{171}{2 \times 50}$ grammes of BaH_2O_2 per litre. Omitting any de-

¹ When such small quantities are in question the gramme is inconveniently large as a unit of weight, and hence throughout the paper the results are expressed in milligrammes.

scription of some preliminary experiments, the process we have found most successful for the analysis of small quantities of the aconite alkaloids is as follows:—A weight of 30 mgrms. of pure crystallized alkaloid, or about twice that quantity of the mixed alkaloids from aconite, is dissolved in about 15 c.c. of ether, and the solution placed in a small stoppered cylinder, together with 3 c.c. of water, containing a drop of a $\frac{1}{10}$ per cent. solution of methyl-orange and previously rendered sensibly pink by a minute addition of acid. Standard hydrochloric or sulphuric acid of $\frac{36.5}{50}$ normal strength ($\frac{36.5}{50}$ of HCl or $\frac{4.9}{50}$ grammes of H_2SO_4 per litre) is then carefully added from an accurately divided burette, with vigorous agitation between each addition. The addition of acid is continued until the lower aqueous layer retains a red tint, even after thorough agitation with the ethereal stratum. Operating in this manner, the reaction is extremely delicate, for the brownish colour exhibited by the ethereal layer, when an impure alkaloid is titrated, in no way interferes, but presents a marked contrast to the colour of the aqueous liquid. The following factors may be used for calculating the amount of acid used to its equivalent of alkaloid:—

1 c.c. of $\frac{N}{50}$ acid	neutralizes	12.94 mgrms. of aconitine		
"	"	10.86	"	" aconine
"	"	14.14	"	" pseudaconitine
"	"	10.46	"	" pseudaconine
"	"	12.44	"	" japaconitine
"	"	10.54	"	" japaconine

These figures are, of course, mere calculations, but it is worthy of note that by actual experiment 30 mgrms. of japaconitine was found to neutralize 2.40 c.c. of $\frac{N}{50}$ acid, which, according to the ratio $HCl : C_{66}H_{88}N_2O_{21} = 36.5 : 1244$, would be equivalent to 59.7 mgrms. of alkaloid. A reference to C. R. A. Wright's paper at this point showed that japaconitine hydrobromide had the formula $C_{66}H_{88}N_2O_{21} \cdot 2HBr$, and hence that the alkaloid represented by the acid used would be only one half the weight previously assumed. This corrected calculation gave a figure closely agreeing with the weight of aconitine taken.

The aqueous liquid containing the neutralized alkaloid was then separated from the ethereal layer (retaining the colouring matter) and treated with 20 c.c. of rectified spirit (neutral to phenolphthalein) and 3 c.c. of a solution of caustic soda in an equal

weight of water. The liquid was then boiled for an hour in a flask under a reflux condenser, after which the alcohol was distilled off and the residual liquid acidulated with hydrochloric acid. The liberated benzoic acid was extracted by agitation with about 15 c.c. of ether, and the ethereal solution separated and washed with successive small quantities of water, until the washings showed their freedom from mineral acid by ceasing to redden litmus.

The ethereal liquid was then separated and transferred to a small cylinder of 25 c.c. capacity, about 5 c.c. of water faintly coloured with phenolphthalein added, and a $\frac{N}{50}$ normal baryta water dropped in till the aqueous layer acquired a pink colour, which was not destroyed by agitation with the ethereal stratum. From the measure of standard alkali consumed the amount of aromatic acid resulting from the saponification was calculated. 1 c.c. of $\frac{N}{50}$ baryta neutralizes 2.44 mgrms. of benzoic or 3.64 mgrms. of veratric acid. Although these acids have different combining weights, the volumes of alkali neutralized by equivalent proportions of them are, of course, identical, and hence no grave difference results in calculating the saponifiable alkaloid, whether benzoic or veratric acid has been produced by the saponification. Thus—

1 c.c. $\frac{N}{50}$ baryta represents 12.94 mgrms. of aconitine saponified.

"	"	"	14.14	"	"	pseudaconitine	"
"	"	"	12.44	"	"	japaconitine	"

In some cases I have endeavoured to estimate the basic product of the saponification, but with less success than has attended the determination of small quantities of benzoic and veratric acids. The acid liquid from which the aromatic acid has been extracted by agitation with ether has been rendered alkaline by potassium bicarbonate, and shaken with ether. Aconine is said to be practically insoluble in ether under such circumstances, but as a matter of fact I have always obtained a considerable quantity in this manner and a very trifling additional quantity on subsequently agitating the liquid with chloroform. But there is reason to believe that aconine is not extracted perfectly by either of these solvents from a liquid rendered alkaline by potassium or sodium bicarbonate. It is probable that a more complete extraction might be effected by the use of caustic alkali. Pseudaconine is said to be readily soluble in ether, and conformably with this statement a full weight of the basic product of the saponification of crude pseudaconitine was obtained.

The following figures (Table A) show the results obtained on applying the foregoing process to samples of pure aconitine and japaconitine kindly supplied me by Mr. F. Ashley Rogers. The results from aconitine were not obtained by the analysis of three different samples, but represent the figures yielded by three separate analyses of the same sample of alkaloid, and hence show the variations to be expected with careful manipulation:—

Table A.

	Crystallized Aconitine from <i>A. Napellus</i> .			Japaconitine, (not quite pure).
	1.	2.	3.	
Weight taken, mgrms . .	30.0	30.0	30.0	30.0
$\frac{N}{50}$ acid for neutralization . .	—	2.31	2.40	2.40
=aconitine	—	29.9	31.0	29.8
				(japaconitine)
$\frac{N}{50}$ baryta for neutralizing acid	2.45	2.19	2.39	2.30
= benzoic acid	5.9	5.3	5.8	5.6
= aconitine	31.6	28.3	30.9	28.5
				(japaconitine)
Basic product:				
Extracted by ether . . .	—	—	20.5	—
Subsequently by chloroform	—	—	0.0	—

So far I have not had the opportunity of examining pure pseudaconitine by the same process, but the mixed alkaloids extracted by ether from a tincture of aconite kindly furnished me by Mr. R. A. Cripps, and prepared by him from roots of *Aconitum ferox* supplied by Messrs. Horner and Co., have yielded the following results:—Alkaloid taken, 76.7 mgrms.; by titration, 74.9 of alkaloid calculated as pseudaconitine. Saponified it required 3.90 c.c. of $\frac{N}{50}$ baryta, corresponding to 14.3 mgrms. of veratric acid, the weight actually extracted by ether being 13 mgrms. The baryta used represents 55.1 of pseudaconitine, leaving 21.6 of unsaponifiable alkaloid (pseudaconine). The basic product of saponification extractable by ether amounted to 66.5 mgrms., an additional 2.0 being extractable by chloroform. These residues required 4.91 c.c. of $\frac{N}{50}$ acid, corresponding to 51.4 of pseudaconine or 69.4 of pseudaconitine.

The foregoing experiments having indicated that the process in question was capable of affording very fair results, considering the very small quantity and the high combining weight of the sub-

stance employed, we examined by the same method some specimens of mixed aconite alkaloids extracted from the root by Messrs. Farr and Wright, and kindly sent me by the latter gentleman. The following results were obtained:—

Table B.

	A.	B.	C.	D.	E.	F.
Weight taken	55.0	51.7	26.0	87.0	21.0	31.5
Aconitine by titration . .	67.0	66.7	29.4	—	28.0	—
Benzoic acid	5.2	4.0	—	8.4	—	4.8
= aconitine	27.7	20.4	—	44.5	—	25.7
Basic product:						
By ether	38.0	—	—	—	—	—
By chloroform	2.0	—	—	—	—	—
By KHO and CHCl ₃ . . .	4.0	—	—	—	—	—
Total, weighed	44.0	—	—	—	—	—
" titrated	48.9	—	—	—	—	—
" " aconitine	58.2	—	—	—	—	—
Percentage of saponifiable alkaloid	50.4	39.5	—	51.1	—	81.6

These results are somewhat erratic, so far as the basic products of saponification are concerned, probably in part owing to incomplete extraction and in part because of the further change aconine is known to suffer when heated with caustic alkali. But as the proportion of saponifiable or active alkaloid is deduced from the acid product, and this can be determined with facility and great accuracy, the immediate object of the research may be said to have been effected.

How far japaconitine and pseudaconitine may be considered equivalent to aconitine in physiological activity, I do not intend to discuss, but may say that the balance of evidence seems to show that the three alkaloids are approximately equally active when in a pure crystallized state.

So far I have regarded aconitine, japaconitine, and pseudaconitine as practically the only alkaloids concerned in the physiological activity of preparations of aconite. I believe I am justified in this view, and that I might even have omitted pseudaconitine from consideration without materially affecting the practical bearing of the question. But I have no doubt it has been in the minds of some present that these three alkaloids are not the only saponifiable bases of the aconites. Thus, *lyaconitine*, the amorphous alkaloid of *Aconitum Lycoctonum*, also yields an acid and one or more bases on saponification (of which one, lycoctonine, readily

crystallizes), but it is doubtful if the reaction can be expressed by any simple formula. *Picraconitine* was isolated by T. B. Groves from a parcel purchased in 1874 as roots of *Aconitum Napellus* of German growth (*Year-Book*, 1874, 510). It is an amorphous, bitter, non-poisonous alkaloid, forming a crystallizable hydrochloride and nitrate, and was found by G. R. A. Wright to yield benzoic acid and a basic principle on saponification. Although picraconitine is well characterized, it does not appear ever to have been met with again, unless the imperfectly examined bitter alkaloid obtained by E. L. Cleaver from *Aconitum paniculatum* was identical therewith. At any rate, in the absence of further evidence of its occurrence, we may regard picraconitine as too rare a base to require consideration in devising a process for the assay of aconite. Besides, its unrecognised presence in a preparation would merely result in the saponification test indicating a greater proportion of physiologically active alkaloid than actually existed, so that the error would be on the right side.

But if it be a fair presumption that the physiological activity of a specimen of mixed aconite alkaloids may be gauged by the proportion of saponifiable base contained in it, there is some reason to doubt whether all specimens of pure crystallized aconitine from *Aconitum Napellus* have even approximately the same toxicity, to say nothing of possible differences in strength between these preparations and japaconite or pseudaconitine.

The first doubt on this point seems to have been raised at the Birmingham meeting of the Conference, when the late Mr. John Williams, in a paper on "Crystallized Aconitine," stated that the aconitine prepared by precipitating a solution of the nitrate by a large excess of nitric acid, in the manner proposed by Alder Wright, did not crystallize in the same well-defined and perfect forms as the original alkaloid. Mr. Williams's experience has since been confirmed by the late Mr. Edwin Richards, who, in a paper written jointly with Mr. F. Ashley Rogers (*Chemist and Druggist*, February 7 and 14, 1891), states that further practice enabled them to effect the crystallization of the alkaloid recovered from the nitrate, which, however, they regard as permanently changed in its nature. The recovered alkaloid they call β -aconitine and attribute to it the melting-point 178° – 180° C., as compared with 182° – 184° (uncorrected) observed by them as the melting-point of the original crystallized alkaloid. Messrs. Richards and Rogers further attribute to the β -aconitine, or alkaloid recovered from the nitrate, a toxicity very materially greater than

that of the original crystallized alkaloid, called by them α -aconitine.

At first sight it appears highly improbable that the mere conversion of aconitine into the nitrate and its recovery from that salt can have any notable effect on its crystalline habit, melting point, or toxicity. But the process in question does not merely consist in forming the nitrate and crystallizing that salt. It involves the solution of the alkaloid in dilute nitric acid, and the precipitation of the nitrate from that solution by addition of an excess of moderately strong nitric acid, in which the salt is insoluble. But Alder Wright has pointed out that the aconite alkaloids, when treated with excess of dilute mineral acid, are very liable to lose the elements of water, with formation of the corresponding *apo-* or *anhydro-bases*. This occurs so readily with pseudaconitine that Wright was at first misled as to the formula of the alkaloid, owing to the substance analysed containing a considerable proportion of anhydro-pseudaconitine. He further states (*Year-Book*, 1878, p. 488) that "in consequence of this ready dehydration, it is difficult to isolate aconitine from *A. Napellus* roots, as the crystallized base is apt to be mixed with apo-aconitine, which closely resembles the parent alkaloid. . . . The hydrobromide of apo-aconitine, however, appears to be more soluble in water than that of aconitine, so that by converting the mixture of bases into hydrobromides, crystallizing, and regenerating the alkaloid from the crystals, pure aconitine is obtained, the apo-aconitine remaining in the mother liquors."

Apo-aconitine is stated by Wright to melt one or two degrees below the parent alkaloid, and to be obtained by the evaporation of its ethereal solution in small colourless crystals, which cohere and stick to the sides of the glass vessel in a characteristic manner. In physiological activity it appears to be "not inferior" to the parent alkaloid. It appears highly probable, therefore, that commercial crystallized aconitine and the nitrate sometimes contain considerable admixtures of apo- or anhydro-aconitine, and that this fact is the true explanation of the alteration in crystalline habit and melting-point observed by Richards and Rogers. But if the physiological activity is largely increased by the dehydration, it is eminently important to abandon any process of purification which involves such a change, or which does not include the elimination of the altered alkaloid. The statement of Richards and Rogers, that a very large increase in the toxic activity of crystallized aconitine is produced by the nitric acid

treatment, requires the support of confirmatory testimony before it can be positively accepted as correct; but it is at least eminently suggestive, and if confirmed will go far to explain the conflicting and perplexing statements of various observers as to the relative potency of the several brands of commercial aconitine.

The PRESIDENT said the suggestions made in this paper were very ingenious, and might lead to a process which would be found satisfactory for titrating the alkaloidal strength of galenical preparations of aconite.

Mr. J. C. UMNEY having had the opportunity recently of working for some time on these alkaloids thought he might fairly make one or two remarks on this paper. In the first place, referring merely to alkaloids of *A. Napellus*, the process of saponification by an alkali and then titrating the benzoic acid was perfectly incorrect, for this reason. As had been pointed out by Dr. Wright and Mr. John Williams, in addition to the amorphous base aconine, the aconitine was associated in that plant with another base, which had subsequently been examined by Jürgens, and the results stated in a paper which had not, he believed, been translated into English, so that there were three bases really in *A. Napellus*. The base examined by Jürgens also by saponification yielded benzoic acid. The total amount of alkaloids was about .07 per cent., and of these about .02 to .03 consisted of this other base, which was also saponifiable. The actual percentage of benzoic acid which it yielded on decomposition he did not remember, but the formula for the amorphous base with which it was associated was that of a smaller molecule than that of aconitine. During the past ten months he had been making experiments on these bases, but as they had been made in conjunction with Professor Dunstan in the Research Laboratory he did not feel at liberty to state what the results were. He had, however, had the opportunity of confirming exactly what Jürgens said about the association of this other base with aconitine, which yielded benzoic acid on splitting up either by alkalis or acids. The plants worked upon had been grown especially for the purpose by Mr. Holmes, and were carefully selected, so that there could be no doubt about the association of other bases from other roots, such as *A. lycotonum*, which Mr. Allen had mentioned as yielding benzoic acid. This, therefore, would make a difference of possibly 50 per cent. in the estimation of the benzoic acid.

Mr. ALLEN asked how that occurred.

Mr. UMNEY said the aconitine was associated with another base which also yielded benzoic acid. The process described by Mr. Allen consisted in estimating the total amount of benzoic acid obtained by saponification from the alkaloidal constituents taken out of a certain sample, calculating back into aconitine, and saying the alkaloidal yield was so much aconitine. But as that base was associated with another which yielded benzoic acid possibly to an equal extent, there would be an error of about 50 per cent. With regard to aconine he understood Mr. Allen to say that it was soluble in anhydrous ether, which was incorrect. The other base associated with aconitine in the plant which yielded benzoic acid was, he believed, an inert base; at any rate, he had taken a fair quantity of it without feeling any harm.

Mr. SHORT said Mr. Allen had mentioned that phenolphthalein, which he used as an indicator, was inactive towards a number of alkaloids; but morphine reacted in the opposite direction, as an acid, toward phenolphthalein, probably owing to its containing an hydroxyl group.

Mr. DOTT asked if there would not be a great difficulty in preserving the proper standard of the baryta water, if there were any access of carbonic acid. He knew that phenolphthalein and methyl-orange were employed for obtaining very delicate results, but understood they were interfered with by the presence of small quantities of unknown substances. He had noticed that rectified spirit required a certain amount of soda to be added to it before the characteristic colour was produced with phenolphthalein; was that in consequence of the rectified spirit containing some free acid?

The PRESIDENT said the thanks of the Conference were due to Mr. Allen for his interesting and suggestive paper, which would probably lead to some plan of standardizing these potent preparations, which were now often very indefinite.

Mr. ALLEN, in reply, said much of the spirit in commerce was distinctly acid, and would require the addition of several drops of alkali to it before it would cease to decolorize phenolphthalein. In all cases of titration it was necessary to start with the same conditions with which the experiment concluded. If there were to be a slight alkalinity in the end the operator must start with that, and make the reagents comply with the conditions to begin with. He had not the smallest doubt of the accuracy of phenolphthalein estimations; he was using it every day for all kinds of

oil and fat analyses, and he had every confidence in it. As to methyl-orange, there were, no doubt, good and bad specimens; he had exchanged opinions with Mr. Dott about that before, but he had no doubt of its value as an indicator. Of course, baryta water was liable to change; but how much better it was to have a solution which, when it changed, showed it had done so, than one which absorbed CO_2 and gave no indication of it, like caustic soda. If you had clear baryta water you knew it was all right, and you could set it at the very moment you made the experiment, if necessary. It could be kept in a special apparatus into which carbonic acid was not allowed to enter, and drawn from it when required. But it was not necessary to have any complicated apparatus. The difficulty was in getting distilled water sufficiently pure, neutral, and free from carbonic acid to dilute a tolerably strong solution down to $\frac{1}{500}$, but those were points which a little skill in manipulation would readily overcome. A far more serious matter was the comment made by Mr. Umney on the benzoic acid titration process, and, therefore, on the whole saponification method originally suggested by Dr. Wright, and now worked out by him (Mr. Allen) for these small quantities, which was said to be absolutely valueless.

MR. UMNEY said his remarks applied to *A. Napellus* only.

MR. ALLEN said the reason given was, first, because there was a gummy base found by Groves.

MR. UMNEY said the gummy base he had referred to was not found by Groves. The "picraconitine" which Mr. Groves found had never been found by anyone else, and by him only on one occasion. The gummy base he had referred to was found originally by Dr. Wright, who made a combustion of it, and confirmed subsequently by Williams and by Jürgens. Professor Dunstan referred to it in a paper recently read before the Chemical Society, and he (Mr. Umney) had subsequently investigated it with him.

MR. ALLEN said they agreed, then, that Mr. Groves' picraconitine had never been met with again, or, as he had said, it was of too rare occurrence to trouble about. On the other hand, there was the gummy base said to have been described by Mr. Williams and Dr. Wright, which was subsequently obtained by Jürgens and now the subject of unpublished researches by Professor Dunstan and Mr. Umney. In reading very carefully Messrs. Dunstan and Ince's paper, he did not see any mention of it, and when you came to a gummy base which was not named or analysed, but only reserved for further investigation, you generally put it down in the

category of mixtures or impure substances which were never heard of afterwards, or which the next investigator proved to be of indefinite character. If it had been isolated in quantity equal to that of the crystalline aconitine from *A. Napellus*, and at the same time was not poisonous, it was quite clear that it was a very serious and possibly a fatal objection to his process, always providing that it was saponifiable, which he did not think some of the investigators mentioned had stated it to be. But that was all in the future, and he rather protested against a paper, which after all was entitled "Suggestions," being condemned in that wholesale manner simply because of unpublished and uncriticized observations, which when they saw the light might possibly be found valuable, but which at present could not be dealt with. If papers were to be discussed on such a basis they would never make any advance at all. He should look forward with the greatest interest to the publication of these experiments, for he was quite sure they did not know anything like the whole about these aconite bases. The contradictory statements made as to the solubility of aconine in ether has caused him to look carefully into that subject. It was said not to be extractable by ether from aqueous liquids, but that was quite a different thing from being insoluble in anhydrous ether. It was a little doubtful if they knew what aconine was, notwithstanding Professor Dunstan's researches. He was a little shy about accepting as a chemical individual a substance which would not crystallize. But however that might be, there was no doubt whatever that if there had been isolated another gummy inactive base of definite composition, which was saponifiable, and which yielded at least as much benzoic acid as aconitine, or more, though if it were of larger molecular weight than aconitine, as stated by Mr. Umney, he did not well see how that could be—perhaps Mr. Umney would make that clear afterwards.

Mr. UMNEY said his statement was that he could not give any results of his own work, as they were unpublished, but he had given the results of Jürgens and others which were published.

Mr. ALLEN said the results obtained by Jürgens were no doubt of the utmost importance, and they would all be glad to see them if ever they appeared in an available form. The present paper was simply intended to show what could be done in the direction of the determination of very small quantities of alkaloid and the products of their saponification; and many of the suggestions were really applicable to other alkaloids as well as to those of

aconite. It did seem to him an extraordinary thing that the Pharmacopœia should prescribe the use of the English root, when it was almost unobtainable. Messrs. Farr and Wright had to go to the German root to prepare their tincture, although according to the B. P. it had to be made from the English root. That was an anomaly which he thought ought to be put an end to.

The PRESIDENT said it was satisfactory to know that Professor Dunstan and his colleague had the matter under consideration, and the paper recently laid before the Chemical Society was only a preliminary instalment of what might be expected. They would all look forward with great interest to these important questions being settled. They had been reproached even by medical authorities because they did not know what the active constituents of aconite were, and that they were supplying an article under the name of aconitine which medical practitioners dare not administer internally as a medicine. Professor Dunstan and his colleague had so far defined the present pharmaceutical preparation, and there was very little doubt of what they did get from *A. Napellus*, and the further investigation of the other bye-products would be looked forward to with great interest. They were much indebted to Mr. Allen for his process for estimating the amount of the alkaloid which was probably the most active in *A. Napellus* and in the Pharmacopœia preparations; with modification it might be of service.

A vote of thanks to Mr. Allen was then passed.

The next paper read was entitled—

SOME NOTES ON OIL OF EUCALYPTUS AND EUCALYPTOL.

BY R. H. DAVIES, F.I.C., F.C.S., AND T. H. PEARMAIN.

Having recently been engaged in the examination of several specimens of oil of eucalyptus we have thought that the results would prove of interest to the Conference, and, though not affording the necessary data for a satisfactory answer to the "Blue List question 23," "Has not the time arrived for defining more exactly *Ol. Eucalypti*, B.P.?" might be of some assistance in that direction.

In all, some twenty-four samples of oil have been more or less

Sample No.	Reported botanical source.	Geographical source.	Specific gravity.	Specific rotation (c.p.)	Solubility of salicylic acid.	Phellandren reaction.	Solubility in rectified spirit.	Acidity as acetic acid.	Iodine absorption equivalent.
1	<i>E. Globulus</i>	S. Europe.	.9025	Degrees. +18.09	Acid. 1 requires 6.1	Negative.	Oil. —	P.c. —	P.c. 142.43
2	"	"	.910	- 3.01	1 " 4.7	"	—	—	128.51
3	"	"	.910	- 0.27	1 " —	"	—	—	71.83
4	<i>E. odorata</i>	Australia.	.9013	+17.7	1 " 6.1	"	—	—	106.95
5	<i>E. oleosa</i>	"	.9228	- 3.82	1 " 3.1	"	5 in 1	0.04	41.1
6	"	"	.927	- 3.81	1 " 3.0	"	—	—	—
7	"	"	.9221	- 4.69	1 " —	"	—	—	—
8	<i>E. amygdalina</i>	"	.9845	-4.72	1 " 11.6	Phellandren present.	—	—	133.73
9	"	"	.9196	+ 5.03	1 " 3.5	Negative.	—	—	79.64
10	<i>E. dumosa</i>	"	.9848	+ 0.87	1 " 5.9	"	—	—	155.89
11	<i>E. dealbata</i>	"	.9827	—	1 " 7.1	"	—	—	168.72
12	<i>E. Baileyana</i>	"	.9894	+13.10	1 " 3.9	"	3 in 1	0.11	162.67
13	Unknown.	"	.8788	-43.22	1 " 7.8	Ph. present.	2 " 1	0.09	163.77
14	"	Unknown.	.913	+ 2.97	1 " 3.9	Negative.	5 " 1	0.09	101.48
15	"	"	.913	+ 4.52	1 " 3.5	"	2 " 1	0.09	—
16	"	"	.8575	-64.72	1 " 14.9	Ph. present.	Incompletely soluble.	0.03	—
17	"	"	.8505	-59.75	1 " 17.6	"	2.3 in 1	0.02	—
18	"	Unknown.	.9065	+ 8.21	1 " 4.9	Negative.	2.5 " 1	0.14	—
19	<i>E. Globulus</i>	"	.9174	+ 5.23	1 " 3.6	"	—	0.02	—
20	Unknown.	"	.8712	-61.3	1 " 12.6	Ph. present.	Incompletely soluble.	0.07	192.89
21	"	"	.8754	-50.37	1 " 12.6	"	3 in 1	0.09	176.77
22	"	"	.9115	+ 0.49	1 " 6.3	Negative.	2.5 " 1	0.23	—
23	"	Australia.	.916	+ 2.73	1 " 4.5	"	5 " 1	0.20	—
24	"	Unknown.	.910	-19.23	1 " 6.0	"	—	0.12	—
Average of all the samples									
Lowest			.9015	-13.15	1 to 7.6	—	5 in 1	.09	139.61
Highest			.9573	-64.72	1 " 3.0	—	5 " 60+	.23	41.10
Average of "heavy class"									
Lowest			.9125	+ 2.65	1 " 4.95	Ph. absent.	3.3 " 1	.11	101.75
Highest			.9894	-19.23	1 " 3.0	"	5 " 1	.02	41.10
Average of "light class"									
Lowest			.927	+13.09	1 " 8.3	"	2 " 1	.23	162.67
Highest			.8721	-53.26	1 " 12.8	Ph. present.	2 " 1	.06	177.47
Lowest			.8575	-64.72	1 " 7.6	"	4 " 60+	.09	163.77
Highest			.8845	-40.20	1 " 17.6	"	—	—	192.89

completely examined. With the exception of three (numbers nine, ten and eleven) they may all be regarded as commercial specimens of the oil. The botanical sources of the first seven samples are stated on the representation of the manufacturer or his agent, numbers eight to eleven are duplicates from the Pharmaceutical Society's Museum, for which we are indebted to the courtesy of Mr. E. M. Holmes. Numbers twelve to nineteen are commercial specimens obtained in London during this year, and the remaining five are similar specimens that have been in stock for three years or more.

Speaking broadly, these results confirm and emphasise the conclusion drawn by MacEwan and others as to the two well-marked varieties of eucalyptus oil.

The first kind of oil has a sp. gr. of 0.900 to .930, has but little rotation, remains liquid when subjected to the action of nitrous acid, showing absence of phellandren; whilst the second has a gravity .885 or lower, a strong rotation to the left, and yields a solid mass when treated with nitrous acid, owing to the phellandren it contains.

It appears also that the heavier oils as a class dissolve salicylic acid more readily than the lighter, for in the former case, out of 16 specimens tested the amount of oil required to dissolve one part of acid varied from 8.3 parts to 3.0 parts, whilst in the latter the smallest weight of oil was 7.6 and the largest was 17.6. The average amount of oil required by the heavier was 4.8 parts, and of the lighter 12.8 for one part of the acid. We are not disposed to attach too much importance to this distinction, since it happens that the four lightest oils were not completely soluble in ten times their weight of rectified spirit, and this fact, taken conjointly with the unusually high rotation and the sparing solubility of salicylic acid, casts some suspicion on these commercial specimens as to their freedom from adulteration.

The acidity of the samples calculated as acetic acid varied from 0.02 to 0.23 per cent., being on the average of 0.1 per cent. nearly. Age, as might be anticipated, affects this to some extent, the average for the five older oils being 0.14 per cent., and for nine more recent commercial specimens only 0.07 per cent.

The mode of working these tests we may briefly indicate here.

The specific gravity was taken at 60° Fahr, water at 60° F. being unity.

The specific rotation was determined in a Laurent's polariscope, in 100 mm. tube.

In order to determine the solubility of salicylic acid in the oil, about 4 c.c. of the latter was shaken and allowed to stand in contact with an excess of powdered salicylic acid, the "physiologically pure" artificial acid being employed. After some hours standing the oil was filtered into a tared flask and weighed. This gave the weight of oil and dissolved acid (α). Spirit was now added, and the amount of acid present found by titration with volumetric solution of soda one-fifth normal strength, phenolphthalein being used as indicator. The amount of acid found being deducted from (α) gave the weight of the oil in which it had been dissolved.

The acidity was found by dissolving a known weight in neutral spirit and titrating with alkali.

The phellandren test was applied by dissolving 1 c.c. of the oil in 2 of glacial acetic acid, and adding $1\frac{1}{2}$ c.c. of a saturated solution of nitrite of sodium, when the oil separates and rises to the surface, absorbing at the same time nearly all the nitrous anhydride set free, the oily layer becoming solid when phellandren is present, and remaining liquid when this terpene is absent.

So far we are of opinion that the amygdalina oil is the only commercial eucalyptus oil that contains phellandren, and that this test is valuable for distinguishing the oil of this species.

This would also seem to be the only eucalyptus oil in commerce of so low a specific gravity. In a list of the characters of the oils from twelve species of eucalyptus (*Pharm. Journ.* [3], ix., p. 430) the gravity of amygdalina oil is stated as .881, a fair agreement with our result. The oil of *E. corymbossa* is stated to have the same gravity; the remaining ten vary from .899 to .940. The writer specially mentions as characteristic of amygdalina oil that it resinifies when exposed to air, a property we find possessed to a far greater extent by this than by any other oil examined by us.

In this connection we may be permitted to quote the relative yields of some oils given in von Mueller's "Eucalyptographia" from 1000 lbs. leaves and twigs: *E. Globulus*, 120 ozs. *E. oleosa*, 200 ozs. *E. amygdalina*, 500 ozs. (*Pharm. Journ.* [3], x., 1035).

On looking through the literature of the subject we could find very little as to the medicinal value of the several constituents of eucalyptus oil, nothing more in fact than a general statement, frequently repeated and nowhere denied, that "eucalyptol" was a valuable constituent, and a fairly general assumption that it was the active ingredient. The chemical character of eucalyptol, however, has undergone some change and development since Cloez named it in 1870 (*Pharm Journ.* [3], 1, ex *Repertoire de*

Pharmacie), and the characters of the pure substance now recognised as identical with cajuputol and cineol are pretty definitely established.

Eucalyptol, it is now generally agreed, has no optical activity, boils at 176–177° C., and crystallizes when cooled in a freezing mixture.

We concluded to attempt a rough estimation of the eucalyptol the oils of known origin contained by taking advantage of these three characters. Fifty c.c. of each of seven oils were distilled, the receiver being changed when the thermometer indicated 170° C., 175°, 180°, 190°, and 200°, the proportions of the several fractions being given in the table on page 470.

The numbers above the botanical name are those corresponding to the oils in the first table. The distillation was carried above 200° C. only in the case of the amygdalina oil, which yielded 4.2 per cent. between 200° and 220°. The fractions (*b*) and (*c*) being assumed to contain the bulk if not the whole of the eucalyptol were examined in the polariscope with the results recorded in Table II.

These fractions were all placed in melting ice for some time, and then in a mixture of ice and salt, but no separation of crystals was observed in any of them. This negative result subsequent experience causes us to believe might not have occurred, at any rate in all cases, if the exposure to the freezing mixtures had been more prolonged and accompanied by brisk stirring.

From the volume and rotatory power of the distillate, *E. oleosa* and *E. Dumosa* appeared to be specially indicated as most suitable for attempting the preparation of a body having the characters ascribed to eucalyptol.

Accordingly, 500 c.c. of the oleosa oil ((7) Table I) were carefully fractionated, the receiver being changed at 170° C. (*a*), 175° (*b*), 177° (*c*), 180° (*d*), and 200° (*e*). The two extreme fractions (*a*) and (*e*) were discarded. Fractions (*b*) and (*d*) were mixed and redistilled, the portion coming over between 174° and 177° being separately collected and mixed with (*c*). We now had 255 c.c. of almost colourless distillate of sp. gr. 917, and possessing rotation of 1°.65 to the left for the 100 mm. tube.

The rotation of the other fractions was found to be as follows, for 100 m.m. :—

Fraction boiling below 174° C., 1.16°.

” ” between 177–180° C., 4.0°.

” ” ” 180–185° C., 4.16°.

” ” ” 185–200° C., 9.0°.

Fractional Distillation of the Oils.

Fraction Collected.	(1) <i>Globulus.</i>	(2) <i>Globulus.</i>	(3) <i>Globulus.</i>	(4) <i>E. odorata.</i>	(6) <i>E. oleosa.</i>	(8) <i>E. amygdalina.</i>	(9) <i>E. Dumosa.</i>
Below 170° C. (a)	5.2 p. c.	42.6 p. c.	4.4 p. c.	12.8 p. c.	10.4 p. c.	5.2 p. c.	8.6 p. c.
Between 170°-175° (b)	38.2 "	28.8 "	20.0 "	29.6 "	38.0 "	33.0 "	41.4 "
" 175°-180° (c)	21.0 "	9.8 "	18.0 "	26.6 "	27.4 "	22.6 "	22.4 "
" 180°-190° (d)	17.0 "	7.4 "	20.2 "	15.6 "	12.4 "	15.0 "	12.8 "
" 190°-200° (e)	5.8 "	3.8 "	8.8 "	7.2 "	4.8 "	5.8 "	5.0 "
Residuum	12.8 "	7.6 "	26.6 "	8.2 "	7.0 "	18.4 "	9.8 "

Table II.

	(1) <i>Globulus.</i>	(2) <i>Globulus.</i>	(3) <i>Globulus.</i>	(4) <i>E. odorata.</i>	(6) <i>E. Oleosa.</i>	(8) <i>B. amygdalina.</i>	(9) <i>E. Evmosa.</i>
Rotation of 100 mm.—							
(b) 170-175 fraction	+17.63	-2.36	+4.70	+16.96	+1.56	-48.5	+7.05
(c) 175-180 "	+16.76	-1.70	+2.66	+17.0	+2.01	-48.06	+4.5
Volume of (b) + (c)	59.2 p. c.	38.6 p. c.	38.0 p. c.	56.2 p. c.	65.4 p. c.	55.6 p. c.	63.8 p. c.

Prolonged exposure to ice and salt caused crystallization in the larger fraction (174–177° C.), when the thermometer fell to -10° C. and the liquid was briskly stirred; a small quantity in a test tube became solid after exposure to -14° C. Exposure to the same degrees of cold of all the remaining fractions did not cause any crystallization.

The bulk of this distillate was placed in a thin wide-mouth bottle and surrounded by ice and salt, and when sufficiently cooled (to -10° C.) some of the crystals formed in a smaller portion in a test tube were added, and crystallization of the bulk was thus induced. The whole was kept at this temperature for over an hour, and then the liquid portion was separated as far as possible by being drawn up into a wide tube, over the lower end of which muslin was tied. In this way a crust of fine white crystals was obtained, closely resembling menthol in appearance, from which it was possible to drain most of the remaining liquid oil before removing from the cold mixture. When removed they instantly commenced to melt, but the thermometer did not remain steady, it continually rose, the rise being slowest at about -6° C. (20 F.). The crystals had all disappeared when 0° C. was reached.

This is the nearest approach to eucalyptol we have so far been able to obtain. The laboratory thermometer having stood at 70° F. when this operation was being conducted, the conditions were somewhat unfavourable for keeping up a sufficiently low temperature; better results may be expected in the winter.

The total amount of this product that had been crystallized was 120 grams, equal to 26 per cent. of the oil originally taken. Its specific gravity at 60° F. was 919.06. Specific rotation $[\alpha]_D -1.59^{\circ}$, observed rotation in 100 mm. tube 1.46° . It possessed the peculiar penetrating odour frequently described as ethereal to a greater extent than any other fraction. Its rotation was somewhat smaller than that (-1.65°) of the bulk before freezing, and it was more nearly colourless. We have no doubt, however, that the oil removed from the crystals the "mother liquor," so to speak, contains a considerable proportion still that might be removed by a longer exposure and a lower temperature. This oil amounted to 116 grams, and was found to have a rotation per 100 mm. of -2.16° .

We thought it would be desirable to compare our product with the eucalyptol of commerce, and for this purpose obtained eight specimens from London houses. The points tested were, specific gravity, rotation, action of nitrous acid, result of cooling, per-

centage of iodine absorbed. The results obtained were as follows:—

Sample.	Specific gravity 60° F.	Observed rotation 100 mm. tube.	Specific rotation.	Nitrous acid test	Result of cooling.	Iodine absorption.
(a) Pure eucalyptol . .	·9285	none	none	negative	hard solid	p. c. 7·14
(b) Eucalyptol (our own)	·9190	−1°·46	−1°·59	"	solidified	22·15
(c) Eucalyptol	·9104	+7°·58	+8°·32	"	"	101·74
(d) "	·9137	+7°·15	+7°·83	"	"	105·85
(e) "	·9208	+4°·6	+5°·00	"	remd. liquid	90·48
(f) "	·9110	+10°·8	+11°·85	"	"	109·14
(g) "	·9070	+5°·8	+6°·39	"	slight crystallization.	84·61
(h) "	·9205	+4°·43	+4°·81	"	remd. liquid	82·00
(j) "	·8832	−32°·05	−36°·26	phellandren present	"	153·72

In applying the nitrous acid test for the presence of phellandren it was observable that all the samples of eucalyptol became coloured bright green, with the exception of the "pure eucalyptol" and the sample made by us, the former of which remained colourless on standing, whilst our product subsequently developed a greenish tint. Eucalyptus oil always becomes decidedly green under this treatment, hence we suggest that the amount of coloration when performing this test will give some measure of the amount of matter other than eucalyptol in the sample.

On inspecting the table it will at once be seen that "pure eucalyptol" had the properties ascribed to this body, viz., no optical activity and that of solidifying on cooling. The solid so formed was firm, hard and white, altogether different in character from the mass yielded by any other sample. The amount of iodine absorbed (von Hübl's reaction) was smaller than in any other case, so small, in fact, as to make it almost certain that absolutely pure eucalyptol does not absorb iodine. The application of this test will therefore become useful as confirmatory of the degree of purity of a sample. In these three respects our manufacture corresponded more closely with the standard than did any of the other samples.

One sample (j) had evidently been made from *Eucalyptus amygdalina* oil. Its rotation was 36° to the left, and it yielded solid phellandren nitrite, showed no signs of crystallizing at −14° C., and had an iodine absorption equivalent of 153·7. Its specific gravity was, as might be expected, very low, 0·833. This was the

only sample that showed any signs of resinifying on exposure for 24 hours.

The specific gravity of eucalyptol is variously stated by different writers. Watts' *Dictionary* (2nd edition) indicates .923 at 16°, apparently on Jahn's authority (*Pharm. Journ.* [3], xv., 615). Schimmel states (*Pharm. Journ.* [3], xx., 856) that the gravity is .930. At present it is not possible for us to settle this point. The "pure eucalyptol" examined had a gravity of .9285, whilst ours was only .919, and the heaviest other sample was .9208. We hope to be able to satisfy ourselves on this point later on.

The PRESIDENT said there were great variations in the character of the oils met with in commerce; they varied especially in specific gravity, in the amount of phellandren, and also in eucalyptol. There was also the important question whether eucalyptol was the medicinal agent to be looked to as the most active constituent, and a further one as to the botanical sources of the oils. All these questions had been dealt with in the paper, which seemed to favour the *E. oleosa* and *E. Dumosa* oil in preference to that from *E. Globulus* and *E. amygdalina*, the two sources mentioned in the Pharmacopœia. There was little doubt that the oil which contained most eucalyptol, and had the peculiar odour well marked, was most liked for use in inhalers and so on, as it had the most penetrating action. Some samples met with in commerce would be found almost useless for the purpose required.

Mr. PEARS said they were given to understand in the text-books that eucalyptol was obtained by passing hydrochloric acid through the liquid. Did Mr. Davies find that method satisfactory?

Mr. J. C. UMNEY asked if Mr. Davies had made any examination of the citronella-scented eucalyptus oil, which it was stated became perfectly solid on the application of nitrous acid, and also to contain a large percentage of eucalyptol. He was not sure whether it was *E. dealbata*.

Mr. WELLCOME said his attention had been recently called to a considerable demand for the citronella eucalyptus oil, which seemed to be wanted for some special manufacturing purpose in this country, in which it was supposed to be substituted for citronella oil. He believed that at the present time large quantities of it were being shipped to Germany. Whether it was used to sophisticate oil of citronella he did not know, but thought it was mostly used by manufacturing perfumers.

Mr. BURROUGHS said the citronella variety had been found very efficacious in disguising the offensive odour of ichthyol when used in ointments.

Mr. MOSS said it was scarcely likely that the citronella-scented eucalyptus would be used as an adulterant of citronella oil, as none of the latter was imported from or through Germany, but came direct from the East Indies. No doubt the oil might be used as a substitute for it in perfumery, soap-making, etc., but it did not come into the London market as citronella oil.

Mr. MACEWAN added that citronella oil cost at the rate of sixteenths of a penny per ounce, whilst citronella-scented oil of eucalyptus cost 4s. or 5s. a lb., so that there could be no question of using the one for the other. The point in which he considered this paper a very valuable addition to the literature of the subject was that it carried our knowledge as to the eucalyptol content of the oil a step further. All the figures regarding specific gravity, rotation, solubility of acid in the oil, solubility of the oil in spirit, or rather as he would put it, the solubility of spirit in the oil, were all to a certain extent of great importance, but that was nothing compared to the fact which was now definitely proved, that certain oils which were regarded as being of less value than *E. Globulus* oil did contain eucalyptol to a considerable extent, as much probably as *E. Globulus*. That was the important point to seize upon. They believed that the active properties of eucalyptus oil were due to eucalyptol, and here was an oil, the *E. oleosa*, which possessed these properties which the President had mentioned as making it preferable for inhalation—fine odour, great penetration, and so on—and that oil also contained eucalyptol to a sufficient extent to warrant its use in medicine. It was quite evident that the fractions having a rotatory power of between 170 and 180° could have little in common with eucalyptol, as that was an inactive body so far as its action on polarized light was concerned. He should like to mention that in the final stages of purification eucalyptol ought to be treated with caustic soda and dry calcium chloride; without that it was impossible to get rid of the resinous bodies, and obtain that definite neutrality which was desirable.

The PRESIDENT said the *E. citriodora*, which yielded a lemon-scented oil, was principally produced in Tasmania, and was used by perfumers and soap makers.

Mr. DAVIES said he had drawn hydrochloric acid gas through small quantities of the oil, but had not used that method in endeavouring to prepare eucalyptol, for one or two reasons. In the

first place it had been stated, though he forgot where, that the eucalyptol obtained by decomposing the bi-hydrochloride, which was the molecular compound formed by passing hydrochloric acid gas into the oil, was to some extent decomposed in the subsequent process, and that it was not so pure as that obtained by the simple process of freezing. Whether that statement were true or not he was not in a position to say, since, so far, the freezing process was the only one that had been tried. He proposed, when the weather was a little more suitable, to try the effect of the hydrochloric acid, and indeed he should not rest satisfied with the eucalyptol he obtained until it had no specific rotation at any rate. It was very difficult to estimate the purity of the eucalyptol obtained; but the crystals were perfectly solid, and the amount of rotation was very considerable. 1.59° appeared a small amount, but remembering that these crystals only formed 50 per cent. of a solution which itself only had a rotation of 1.65 , it was clear that it was a great deal to expect the whole of that rotation to disappear before pure eucalyptol was obtained. If the amount to be separated disappeared at the same rate as the oil had been disappearing from the crude product originally, there would be almost nothing left when the 1.59 had been reduced to no rotation at all. On that account it seemed to him there must be some truth in the statement that the article underwent a change by the formation of the hydrochloride and the subsequent decomposition. With regard to the citronella-smelling oil, he regretted to say that he had had no opportunity of studying it excepting that afforded by the very small quantity sufficient to perform these few experiments. He had seen a statement that eucalyptol occurred in large quantity, and also phellandren, but this particular sample showed no evidence of phellandren at all on being tested with nitrous acid. There were certainly several eucalyptus oils having a citronella-smell and probably the one Mr. Umney referred to was a different species. Mr. McEwan had exactly hit the point of the paper. He did not desire to state definitely that eucalyptol was the active constituent; all he said was that they knew at present of no other, and that being the condition of knowledge, until they were shown that some other constituents were of equal or possibly greater medicinal value, they were justified in looking for an oil which contained a reasonable proportion of that. Any oil that had a rotation to the left, as *E. amygdalina* oil had, clearly could not be an oil which was likely to satisfy those conditions. Some varieties of

Globulus oil would seem to satisfy them more than others, but certainly the *E. dumosa* and *E. oleosa* oils seemed to contain eucalyptol in considerable quantity.

The Conference then adjourned for luncheon.

On resuming, a paper was read on—

CASCARA SAGRADA AND EXTRACTS, WITH SPECIAL
REFERENCE TO QUESTION 8 ON THE BLUE LIST.

By JOHN MOSS, F.I.C., F.C.S.

THIS paper is presented as the result of an endeavour to furnish a reply to question No. 8 in the Blue List. No one is more conscious than the writer that it does not approach completeness, and it is only submitted in the hope that it may be regarded as an instalment which may receive additions on a future occasion or may provoke an instructive discussion now. Though there is nothing of interest, from a chemical point of view, it may prove of some little practical value to the pharmacist.

An attack has been commenced on the chemical part of the subject, but the results are not sufficiently definite for publication. The difficulties of separating a number of proximate plant constituents are only to be overcome by much time and more patience, especially when they consist mainly of resinous bodies which overlap in their characters and are liable to change under the very operations by which it is sought to isolate them. When the separation is effected it is intended to submit the principles to trial and observation under competent medical direction, and in this way it will be possible to furnish an answer to another part of the problem, viz., the relation of the bitter resin to the therapeutic activity.

Liquid Extract with Water. — The British Pharmacopœia directs that the liquid extract of cascara shall be prepared by boiling the coarsely powdered bark in distilled water till it is exhausted, evaporating the decoction until it measures in fluid ounces three-fourths of the weight of bark in ounces, and when cold adding thereto a third of its volume of rectified spirit. The average specific gravity is 1.05. During concentration and towards the end of the operation the decoction lets fall resinous matter of two kinds, one firm even in the hot liquid and the other of a softer character. The hard resin comes down first. The decoction being

removed from this deposit, the softer portion can, whilst still warm, be for the most part separated from the harder one.

The official dose of the *solid* extract of cascara is 2 to 8 grains. Three grains of the harder resin produce a distinctly aperient effect in sixteen hours. The same quantity of the soft resin is only gently laxative at the end of a similar period. No pain was observed with either. The weight of the resins together from 100 lbs. of bark varies somewhat, but averages 1 to 2 lbs.

A cask in which fifty gallons of the fluid extract, prepared as above from commercial spring-gathered 1889 bark (the separated resin was added to it and in great part was taken up on addition of the spirit), at the end of twelve months contained a firm deposit which, when thoroughly drained, weighed 7 lbs. 12 ozs., equivalent to 1·6 per cent. This corresponds closely with the proportion deposited during evaporation of the decoction, as described in a preceding paragraph, and the two have doubtless much in common. The fluid extract withdrawn was brilliant to the last drop.

Three grains of the residue completely dissolved or melted in the saliva in five minutes, the latter portion not so readily, indicating the presence of at least two bodies of different solubility. It was fairly bitter, with the characteristic cascara flavour, and slightly astringent to the tongue. A distinct laxative action was exercised in sixteen hours.

The deposit lost on the water-bath 18·6 per cent. and of the dry extract so obtained 60·2 per cent. was dissolved by water. The solution filtered with difficulty and was dull and opalescent when cold, but became clear on heating. Water does not separate the components sharply, and of course it does not follow that what is soluble in water is also soluble in an aqueous solution of the constituents of the bark. The aqueous solution when evaporated gave a bright bitter extract drying to a deep brown varnish, slightly hygroscopic. It was feebly aperient or laxative in thirteen hours. The portion of the deposit not dissolved by water dried to a black cindery residue on the water-bath and was almost without taste. Three grains acted as a laxative in eighteen hours. In general characters it closely resembled the harder portion of the resins deposited from the original decoction during evaporation, as already described.

Proof spirit dissolves 93·2 per cent. of the dry cask deposit, but drops a portion on standing, so that when filtered the filtrate yields only 78 per cent. of dry residue. Rectified spirit (·838) dissolves 88·2 per cent. of the cask deposit, practically the same as proof

spirit. The portion not dissolved by proof spirit was seen under the microscope to consist of degraded organized matter.

One ounce of ground bark which had been used for the official liquid extract was dried, and percolated with proof spirit till almost colourless. Evaporated, the resulting extract was yellowish brown and oily. It weighed 20.72 grains, equivalent to 4.73 per cent. Three grains taken in the mouth tasted somewhat bitter at first, afterwards acrid, and at the end of five minutes had not disintegrated and required to be swallowed in the mass. In three cases it was not merely ineffective as a laxative, but appeared to exercise a slight astringent action.

Liquid Extract with Proof Spirit.—Seven pounds of thin, spring-gathered 1890 bark were ground to number forty powder and exhausted by percolation with proof spirit. After recovery of the spirit, the residual thin extract was made up to seven fluid pounds by the addition of sufficient strong spirit to make the liquid equal to proof in strength of alcohol. The specific gravity was 1.025. A slight deposit has appeared after three months. In one instance 20 minims were very effective, producing slight pains in seven hours and full purging in fourteen and again in seventeen hours. In a different and less sensitive subject 30 minims produced analogous results. It is not improbable that a smaller dose in each case would have produced merely laxative effects, but further observations are obviously desirable.

Two ounces of the dried marc from the proof spirit liquid extract were boiled with water. The decoction was almost water white, with no tinge of yellow or brown, only dull; and when evaporated yielded mucilaginous residue weighing 48 grains (5.48 per cent.), which gave the reaction for starch with iodine and did not reduce Fehling's solution. It was inert.

The results of these experiments appear to point to the conclusions:—

1. *That an aqueous liquid extract does not represent the full activity of the bark.* Water extracts all the active constituents by boiling, but does not retain them when the decoction is concentrated. From this it follows:—

1a. *That an aqueous solid extract would represent the full activity of the bark.*

2. *That a proof-spirit liquid extract does represent the full activity of the bark.* This extract in the same doses as the official liquid extract produces slight passing discomfort, but no unpleasant effect.

The communication from Dr. James Jardine which follows (and I beg to express my thanks to him for making this report at the instance of a total stranger and solely in the interests of medicine) gives the results of an enquiry into the therapeutic action of cascara collected in different years and seasons and localities. Though not exhaustive it is extremely interesting, and tends to confirm the generally accepted views that bark from South Oregon is preferable to that from the northern parts of the same state, and that the older the bark the more benign is its action. In conclusion, a few explanatory references to Dr. Jardine's paper are necessary.

Liquid Extracts.

(a) Prepared from fine bold quills of thin bark, spring-gathered in 1888, sp. gr. 1.05.

(b) From thin bark, spring-gathered in 1889, sp. gr. 1.05.

(c) From medium thick bark, spring-gathered in 1890, sp. gr. 1.05.

(d) From a special bark kindly collected for me late in the summer of 1890 by Professor Searby on his own estate in Senora county, dried just enough to travel without sweating or moulding, and forwarded by express. This was the most beautiful and carefully prepared specimen of cascara I have seen, and was in small quills uniformly 9 inches long. Within fifty days of collection the liquid extract was ready. There was no separation during evaporation of the decoction. The preparation had a specific gravity of 1.067, was perfectly miscible with water and almost tasteless. After standing ten months it has acquired a bitter taste, and some loose deposit has appeared occupying about 10 per cent. of its bulk. Professor Searby writes, "I have used the same bark (gathered a little earlier) for the last two years with most excellent results. I have used Coos Bay bark and also some from Humboldt county, and so far as *medicinal effects* go, cannot tell the difference. I have never used any but what was gathered in the spring and early summer." Dr. Jardine's observations agree with this, so *it would appear that bark collected in late summer is not inferior to spring-gathered in any respect.*

Solid Extracts.

(e) Prepared by the official process from bark gathered in winter, 1888-9, in Northern Oregon. This bark and that referred to in (f) are fully described in my "Note on Cascara Sagrada" in the *Pharm. Journ.*, Feb. 16, 1889.

(f) From bark gathered in winter, 1888-9, in Southern Oregon.

(g) From commercial spring-gathered bark of 1889.

Dr. Jardine's observations indicate that there is no important difference between the commercial spring-gathered bark and that collected in winter. As was the case in 1889, winter-collected bark may only be looked for when great scarcity and demand hold out a prospect of adequate reward for exposure to the rigours of the season and the greater labour of cutting from the trees. It is, however, some satisfaction to know that winter-collected bark is not valueless. Barks from North Oregon must not, however, be judged too harshly from the unsatisfactory single specimen of winter bark reported upon. Properly collected and cured it may be valuable, but if so the inactivity of the present specimen indicates that it is liable to suffer from malign influences to which the specimen of southern bark has not been exposed.

The PRESIDENT said this paper was one of great interest, cascara having come largely into use in the last few years, in fact during the last ten years it might be said to have been more used than any other laxative.

Mr. KNIGHT said he did not know who was the originator of the official formula, but a more abominable specimen he never knew; probably it was some professor, for no one who knew anything about the business would suggest such a preparation. For some years they had prepared one which was a modification of the process in the U. S. Pharmacopœia, and had given every satisfaction; it was tolerably bright, and was elegant and efficient; it was a fluid extract. In the one there were elegance and efficiency combined, in the other there was neither, for it deposited in as many strata as were to be seen on the neighbouring coast line. With reference to an aqueous solid extract, although more extract could be got by boiling, he thought taking it weight for weight the aperient action would not be equal to that of the other. He might say that since they had discarded the Pharmacopœia process, they found that prescriptions which before had been stamped in all directions, now remained with them; in other words, when people found they got something bright, elegant and active, they were satisfied and went no further. He might, perhaps, be liable to prosecution for supplying an article not of the nature and quality required, but if the official form was decidedly objectionable, he thought most customers would prefer something else.

The Pharmacopœia preparation induced the physician to order special preparations, such as "Ext. Casc. Sag. Fluid. (Jones)."

The PRESIDENT remarked that Mr. Moss reversed the solvents given in the Pharmacopœia, which ordered a weak spirit for the solid extract, and for the liquid extract repeated boiling with water, and afterwards concentration by evaporation. The probability was that a solid extract made with water would contain all the activity.

Mr. CONROY said he could quite bear out what Mr. Moss had said with reference to the preparation of the fluid extract of the Pharmacopœia, with especial reference to the amount of deposit left in the pan after the fluid extract was evaporated down and cooled. He did not at all like the process in the Pharmacopœia, but while it was there they ought to be loyal to it. At the same time it was a fact that the old fluid extract sold before the present form was made official was more active. A fluid extract prepared either with proof spirit or a menstruum of equal parts of rectified spirit and water was more active than the official preparation. They were much indebted to Mr. Moss for this introductory paper on a subject which, as given in the Conference "blue list," would almost form a study for a lifetime, and he hoped he would continue it.

Mr. BURROUGHS said he knew that an aqueous preparation formed by continuous infusion had been used largely, and gave great satisfaction.

A vote of thanks having been accorded to the author,

Mr. Moss, in reply, said he hoped it would not take his lifetime to complete the paper and make it more useful. He had not tried spirit of the strength indicated by Mr. Conroy, but thought it might answer. He did not recommend or otherwise an aqueous solid extract; he merely stated that water did not retain everything in solution, and that proof spirit did exhaust the bark completely and retained nearly everything. The proof spirit liquid extract was no doubt much more active, and produced an equal effect in smaller doses than the watery extract.

Mr. BURROUGHS explained that the extract he referred to was a dry extract made by repeated boilings.

The substance of the following paper was communicated by Mr. Moss.

REPORT ON THE ACTION OF SOME PREPARATIONS OF
CASCARA SAGRADA, LIQUID AND SOLID, RECEIVED
FROM MR. JOHN MOSS, F.I.C., F.C.S.

BY JAMES JARDINE, M.B., C.M. EDIN.

Liquid Extracts.

(a) *Liquid extract of Cascara Sagrada*, 1888.—(The mode of administration of this and the following fluid preparations was in one ounce of water).

This preparation produced in half drachm doses on girls thirteen to sixteen years of age, with habitually constipated bowels, one motion fully formed without liquid parts in from eighteen to twenty-five hours.

In the same patients, one drachm doses produced a motion, the first part of which was solid and the latter portion liquid, in from eighteen to twenty-three hours.—Taken by the same patients in 20 minim doses three times a day, at intervals of five to six hours, it produced a semi-fluid action within twenty-four hours from taking the last dose, and the motion, if any, during the next twenty-four hours was noticed to be less firm than natural to the patient; the action was in most cases unaccompanied by pain except slightly at the time of the action. Most of these patients, unless the bowels were relieved by medicine, would pass several days without any action.

It is difficult without some prolonged use of these preparations to arrive at very satisfactory results, as some of the patients report that a dose acted at one time, and in precisely similar circumstances it did not act at all. In some measure to check the results arrived at on patients, the writer made a martyr of himself, and personally tested every preparation in circumstances as similar as possible. He lives very simply, and as a rule has a regular action in the morning daily. He took one drachm at 10 a.m., one and a half hours after the usual evacuation, and the dose acted in twenty-three hours, once, the motion being about the usual amount, but semi-fluid and unaccompanied by griping.

(b) *Extract Cascarae Sagradae Liq.*, B. P., 1889.—Given in half drachm doses to the same girls, thirteen to sixteen years of age, it acted like the previous preparation of 1888, but was noticed to be less certain in its results, and even in one drachm doses the motions were fully formed and unattended with any pain, in fact as though aperient medicine had not been administered. The writer took one

drachm, which acted in twenty-three and half hours, of about the normal quantity, semi-fluid and unattended with griping.

One drachm was given to a patient who had been in bed three days, and repeated in eight hours, but in twenty-four hours no result was produced. One tablespoonful of castor oil acted in four hours and twenty minutes.

(c) *Extract Cascara Sagrada Liq., Spring, 1890.*—Given in half drachm doses to girls from thirteen to sixteen years, as before, it produced an evacuation of the bowels in from seventeen to twenty-five hours, solid and attended by much pain, like spasms and violent griping, so I concluded that this specimen contained some irritating ingredient, and did not think it wise to give it in drachm doses. The writer took one drachm, and it acted in eleven hours with such severe griping as he has never experienced from aperient medicine. The first part of the action was formed and the latter part semi-fluid. There was a second action in thirty-two and half hours after taking the medicine, entirely of a semi-fluid kind and containing mucus, showing that the intestines had been irritated considerably more than is usual with the preparations of cascara sagrada.

(d) *Ext. Cascara Sagrada Liq., August, 1890.*—Given to girls from thirteen to sixteen years of age in half drachm doses, it acted in from thirteen to twenty-one hours producing a motion at first fully formed, then semi-fluid, with some griping though not of any severe kind.

The writer took one drachm at 4.30 p.m. It produced some griping in twelve hours and again in thirteen hours, the bowels acting in a solid motion; they again acted in fifteen and half hours after taking the dose in a liquid motion with some mucus, and a little griping pain was noticed just before the action.

Solid Extracts.

(e) *Extract Winter, Northern, 1888.*—This extract yielded no active result given in doses of eight grains, the maximum dose of the British Pharmacopœia. The writer twice took that quantity without any result as regards aperient action, so he has concluded that it is inert.

(f) *Extract Winter, Southern, 1888.*—Given in eight-grain doses it invariably acted in from twelve to twenty-two hours, the first portion of the motion being formed and the latter semi-fluid. The writer took 8 grains of it and it acted in twelve and half hours in a semi-fluid motion.

(g) *Extract B. P.*, 1889.—In doses of eight grains this extract acted in twelve to twenty-six hours, the first portion of the evacuation being formed and the last portion semi-fluid. The writer took eight grains and it acted in nineteen hours, the first portion formed, the latter semi-fluid.

N.B.—The solid extracts were administered in the form of a pill without any additional vehicle.

Summary.

With the exception of the solid winter extract, northern, all these preparations possessed active properties of a mild aperient kind, and personally, with the exception of fluid extract of the spring of 1890, I could not distinguish much difference in one extract from another. The difference in that preparation was very distinctive as already described, and with this exception I do not think if I had been given the various preparations without knowing anything respecting them that I could have distinguished one from the other. It is true that some of the preparations acted a little sooner than the others, but in repeating the doses of the same extract on the same patient it was exceptional to find them act in a stated time, in fact, the greatest discord prevailed in this respect so that it seemed impossible to draw definite conclusions without greatly prolonged experiments.

The next paper read was a note on—

CASTOR OIL WITH EXTRACT OF MALT.

BY S. M. BURROUGHS.

CASTOR oil has for many years been regarded as one of the most generally useful aperients, but its use has been considerably limited on account of its nauseous flavour. As many experiments have been made with a view of obviating this difficulty, the idea suggested itself of employing extract of malt as a vehicle, as the extract has been found so useful in masking the taste of cod-liver oil and other medicines of a nauseating character which are objected to by so many people. The specimens presented are composed of equal quantities of oil and extract of malt. They have been submitted to many therapists and a general opinion has been expressed that the nauseous flavour of the oil is very little or not at all perceptible, and that no disagreeable taste is

left in the mouth after the administration. One advantage in the employment of extract of malt for disguising the flavour of castor oil is in the fact that the extract is itself a mild aperient in large doses, and may be found a valuable aid in connection with the castor oil. The rationale is readily seen. The gum in the *Mistura Olei Ricini* tends to cause early decomposition of the preparation, whereas this mixture of castor oil appears to keep perfectly for an indefinite period. It will be observed that the mixture is light and clear. I am not yet able to say whether the oil is actually dissolved in the extract. It may be remarked, however, that upon adding to water the mixture becomes turbid and forms an emulsion. This combination is, I believe, well adapted for giving to children and fastidious persons, and thus assists in making the oil available to patients hitherto unable to take it.

For preparing the mixture, the mortar should be first warmed, and the extract of malt triturated in it until it becomes somewhat liquefied. The castor oil can then be added gradually during continuous trituration.

The PRESIDENT said the peculiarity of this mixture was the way in which the castor oil mixed with the extract of malt, forming a kind of emulsion, though it was so translucent that it hardly had the appearance of an ordinary emulsion.

Mr. GERRARD said the mixture seemed to have a very good flavour; he could distinctly taste the oil of almonds, which was an excellent oil for masking the unpleasant taste of castor or cod-liver oil. He did not think this was a solution, but an emulsion, and probably the reason the little particles of oil could not be seen in it was because the refractive angles of the oil and the extract were the same. There was no better test for a condition of perfect emulsification than that of dilution with water; if that produced a uniform product, which would stand for an hour or so without particles of oil floating on the top, it was a perfect emulsion.

Mr. DOTT thought it would be very interesting if the question could be cleared up whether this was a solution of the oil in the malt extract, or whether the uniform appearance was due to the refraction being the same in both cases. It ought not to be very difficult to determine.

Mr. KNIGHT said he presumed Mr. Burroughs intended equal volumes and not equal parts by weight, as the specific gravity of the malt extract far exceeded that of the oil.

Mr. BURROUGHS said the proportions were taken by measure.

He did not assert that the mixture was a solution, and in the case in which he had mixed some with water at ten o'clock that morning the oil showed itself unmistakably at the top in the form of an emulsion.

Mr. Moss thought the layer at the top of the glass was not pure oil, but an emulsion of oil and extract, comparable to cream on the top of milk, and suggested to the author that he should stir it up. This was done and all mixed again at once and showed the appearance of milk.

A vote of thanks was passed to Mr. Burroughs.

In the absence of the author, the next paper was read by Mr. F. Ransom.

THE OPIUM USED IN MEDICINE.

By E. M. HOLMES, F.L.S.

It is a startling fact that India, which produces an immense quantity of opium, does not supply this country with the drug that is used in medicine. It would at the present moment be almost impossible to purchase in London a specimen of the Government monopoly opium, as supplied to the Chinese. Even the Malwa opium, which simply pays duty, but of which the cultivation is under no restriction, rarely appears in the London market (two chests only were exported to London during the year 1889-1890), and even then never enters the retail drug trade. The great bulk of the opium used in medicine throughout the world is produced in Asiatic and European Turkey.

Yet there is no reason why India instead of Turkey should not supply the whole world with medicinal opium. The chief differences between Indian and Turkish opium exist in the appearance, and in the relative percentage of morphia and narcotine contained in the crude drug.

The appearance of the Turkish opium is due to the fact that in Turkey the concrete juice is placed piece by piece on a poppy leaf, until a lump of varying size, usually from $\frac{1}{2}$ lb. to 2 lb. is formed which is then covered with another leaf and placed in the shade to dry; whilst the Indian opium is collected in a small scoop, emptied into an earthen vessel, often diluted with the washings of the scoop, and is brought home as a wet granular mass, which after draining is exposed to the air in the shade for three or four weeks, and subsequently undergoes a somewhat lengthy process, which is

adopted in the Government manufactories to render it of uniform quality. As it contains on the average 30 per cent. of water, and a certain amount of fermentation takes place, it is not surprising that the percentage of morphia is lower than that of Turkish opium. This may, however, be partly due to the period at which the capsule is incised for opium,* or to the climate, etc.

But the percentage of morphia is not necessarily lower, for it has been shown that opium prepared from plants that grow in the hilly districts of the Himalayas yields 50 per cent. more morphia than those grown in the plains.

The Chinese are so rapidly increasing the cultivation of opium in their own country, that in proportion as the taste for native opium grows with the people, Indian opium must decline in favour and the exports decrease unless another outlet for the drug is found.

"Consular reports from China show that in the northern and inland provinces Chinese opium is taking the place of the Indian drug. It is probable that the increased duties imposed under the Chefoo convention on foreign opium entering China have operated in favour of the consumption of the native drug. In 1889 the area under opium cultivation in the Ganges Valley was further reduced to 459,860 acres, as compared with 518,930 acres in the previous year, and 556,527 acres in 1885. The number of chests of opium imported into Bombay (chiefly from Malwa) was 9 per cent. less than in the preceding year. The decrease is also attributed to the increased poppy cultivation in China and the cheapness of the native drug there, and partly owing to the shortness of the Malwa opium crop."†

It appears probable, therefore, that the manufacture of an opium capable of competing with the Turkish article in European and American markets might be worthy of the attention of the Indian Government. Even if the export of opium to India did not decline, the starting of a new or additional form of the old industry could hardly fail to be a benefit to that empire. Opium is largely used in all malarial countries, and as Africa becomes opened up to civilization, the demand for it must naturally increase; whilst on the other hand, if Turkey ever becomes the theatre of a European war, as it probably may, the supply of the medicinal drug will become unequal to the demand.

* M. Gastinel found that opium collected from the capsules immediately after the flowering, contained only 3 to 4 per cent. of morphia, but yielded 10 to 12 per cent. when collected from capsules nearly ripe.

† *Blue Book*, No. 250, on "East India (Progress and Condition)," p. 86.

At the present time Australia is taxing imported opium with the view of encouraging the home manufacture of opium, but although the drug can be prepared of good quality it is doubtful whether the home-made article can ever compete in price with imported opium, labour being much more expensive there than in either India or Turkey.

It may be remarked further that the very finest opium produced in Turkey, that of Salonica, Malatia, and Tokat, is exported under the name of "shipping opium" to China and to the countries where Chinese coolies are largely employed, and there is therefore already a market in China for the Turkish as well as for the Indian opium.

For the industry to succeed in India, however, it should perhaps be pointed out that in the European drug market it is very necessary that the opium should resemble that of Turkey in appearance, and that the process should be studied in that country before the manufacture is attempted.

It may here be remarked that the British Pharmacopœia orders an opium yielding when dried not less than 9·5 and not more than 10·5 per cent. of morphia, whilst the dried Turkey opium of commerce usually contains 11–15 per cent. of that alkaloid. It is not, however, impossible for the poppy cultivator to provide such an article, for M. Aubergier, of Clermont Ferrand, who commenced the cultivation of opium in Auvergne in 1844, found that the percentage of morphia varies with the variety of poppy used, the purple one giving the best results, and that by mixing assayed samples he was able to produce an opium containing uniformly 10 per cent. of morphia. There is no apparent reason, therefore, why an opium conformable to B.P. standard should not be prepared under English supervision in India. With less labour than the Government monopoly opium is now prepared, and with consequently less expense, it would be possible to prepare an opium in India which could successfully compete with medicinal opium in the drug markets of the world. The use of artificial heat, as employed by M. Aubergier, or of hot air in drying the opium, would lessen the time employed in its production and thus, perhaps, ensure an earlier market. With regard to the price at which opium can be prepared in India, although the market price is 10–15 rupees per lb. in Bombay, it is stated that the price given to cultivators by Government is approximately 3s. 6d. per lb., and the peasant is said to be fully remunerated at that price. The poppy seed, which yields 35 to 42 per cent. of fixed oil, is con-

sidered to yield a return about two-thirds the value of the opium, being used for culinary purposes like olive oil.

The PRESIDENT regretted that Mr. Holmes was not able to be present, but he presumed the sample sent was Malwa opium; it was rather hard and dry from being kept in the Museum, and probably in the natural condition would be moister. The likelihood of China importing less opium from India would probably at some future time have an important effect on the revenue of India, and Mr. Holmes looked forward to a market for Indian opium being found in Europe. In addition to this source there was also a small cultivation of opium in Egypt, but it was mostly used by the natives themselves. He saw it sold in the bazaars in Cairo in a form suitable for native consumption, much adulterated, and not at all dangerous, as it contained but a small percentage of morphia. It was not sold by recognised pharmacists but by native traders. Yet genuine Egyptian opium was of fair quality.

Mr. DOTT said the paper evidently had reference to the future rather than the present; for Indian opium would have to be much improved in quality before it could compete with that from Turkey or even from Persia. There might be some specially fine qualities produced; but ordinary Indian opium was a very inferior article, and any one who tried to prepare morphine from it would find it very unsuitable.

Mr. CONROY thought from the appearance of this sample that it would make a very nauseous tincture. In general character it looked very much like Persian opium, and that made a very unpleasant kind of tincture. He feared, therefore, it would not be suitable for galenical preparations. He was pleased to see that Mr. Holmes spoke of the morphia strength of the Asia Minor opium. In his short note read in the morning he alluded to the fact that according to his experience the alkaloidal strength was from 12 to 15, whilst Mr. Holmes gave it as 11 to 15. He thought that was an additional reason why the official strength should be raised.

The PRESIDENT suggested that at the price of 3s. 6d. a lb. it would probably pay the manufacturer to employ this opium even though there might be a difference in the mode of extraction of the morphine.

Mr. F. PASSMORE said the object of the paper was apparently not to argue in favour of using Indian opium as now produced,

but that in view of a probable decline in the demand for this opium by the Chinese it might be worth while for the Indian Government to devote some attention to the improvement of the product, so as to render it suitable for English consumption in place of Turkey opium.

The PRESIDENT said he recently received a visit from a gentleman from India who wanted information as to the estimation of morphia in opium. He understood that at present the only method employed was the rough-and-ready one of solubility in water, and something more exact was required.

A vote of thanks was passed to Mr. Holmes.

In the absence of the author, the next paper was read by Mr. W. A. H. Naylor.

REPORT UPON MEDICATED LOZENGES, B.P.

BY FREDERICK DAVIS, B.Sc.

THE analyses connected with this report were commenced by me three years ago. Since that time I have at various periods continued my researches, and am now able to place before you the following results.

Samples were obtained from six of the leading manufacturers (*id est*, three London houses and three provincial). I have directed my observations chiefly to the following points, which for convenience I will take *seriatim*.

Firstly, the weight of each lozenge; secondly, the quality and nature of the gum employed; and thirdly, and the most important, the quantity of active ingredient contained in each lozenge.

I have found the lozenges of various makers to differ very materially in weight, and not only the lozenges of various makers, but lozenges in the same parcels varied to the extent of 2 grains; the appended table shows the *average* weights.

Secondly, the quality of the gum employed. In three out of the six samples no gum acacia was present at all, a substitute of either tragacanth or tragacanth and dextrin being employed. In two of the remaining three cases a mixture of acacia and tragacanth was employed; whilst in the remaining sample dextrin was substituted for a portion of the acacia.

Thirdly, quantity of active ingredient in each. By taking half a pound of lozenges and estimating the quantity of active ingre-

dient the result was satisfactory in some few cases and very unsatisfactory in others, and when each individual lozenge was estimated a deficiency or excess of active ingredient became apparent.

I append a table, p. 492, showing the quantity of active ingredient by operating upon half a pound of the respective sample, and taking the average by division for each lozenge, and in the second column the quantity obtained from the largest lozenge found in the respective samples.

It will be observed the lozenges, as met with commercially, differ very considerably, not only in size and shape, but in strength. This is the more regrettable because whilst the lozenge is a palatable and convenient method of administering unpleasant drugs, it should be none the less accurate in its composition. Such being the case, the remedy would appear to resolve itself into one of three courses, namely, for every pharmacist to prepare his own lozenges, each having a definite weight, or that the Pharmacopœia should state the exact weight of each lozenge, and not, as at present, that a certain mass be divided into a certain number of parts which may be either equal or unequal (it is true the Pharmacopœia directs the lozenges to contain definite quantities of active ingredient, but this in practice is evidently not the case owing to the unequal weights of the lozenges themselves), or, as the *Lancet* recommended some months since, that the lozenges be omitted from the Pharmacopœia altogether.

It is, perhaps, needless for me to add this short paper is not intended as an exhaustive report, but merely an indication of the state of things concerning the points at issue.

The PRESIDENT said this report contained rather grave reflections on lozenge manufacturers. There was not much difficulty in lozenge-making, and he had made several small quantities experimentally, including several pounds of sulphur lozenges. He was surprised to find so much variation in the weights and in the amount of the medicament contained. Some ferrum redactum lozenges, which should contain 1 grain each, were found to contain $1\frac{1}{4}$ or $1\frac{1}{3}$ grain, and in one there was as much as $1\frac{2}{3}$ grain.

Mr. ATKINS said the Conference was much indebted to Mr. Davis for this paper, but it was quite possible that its importance might be exaggerated, especially by outsiders. The idea of the ordinary pharmacist making all his own B.P. lozenges was absolutely utopian. In some few establishments it might be possible, but the ordinary pharmacy of the country was of a very different

Table No. I.—Average Weight of each Lozenge in Grains.

Sample.	Acid benzoic.	Acid tannic.	Bismuth.	Catechu.	Per iodact.	Ipecac.	Morphia.	Morphia et spec.	Opium.	Chlorate potash.	Santonin.	Soda bic.	Sulphur.
I.	17	17	27	16	17	17	16	15	14	22	16	20	17
II.	17	15	30	16	17	17	16	15	15	23	15	20	17
III.	17	17	30	15	18	17	16	15	15	22	17	21	20
IV.	16	16	28	15	17	17	17	17	15	21	15	22	21
V.	16	15	27	15	17	17	17	16	17	21	16	21	18
VI.	16	17	27	15	17	15	17	16	14	22	15	23	19

Table No. II.

Sample.	Acid benzoic.	Acid tannic.	Bismuth.	Catechu.	Per iodact.	Ipecac.	Morphia.	Morphia et spec.	Opium.	Chlorate potash.	Santonin.	Soda bic.	Sulphur.
I.	17	17	27	16	17	17	16	15	14	22	16	20	17
II.	17	15	30	16	17	17	16	15	15	23	15	20	17
III.	17	17	30	15	18	17	16	15	15	22	17	21	20
IV.	16	16	28	15	17	17	17	17	15	21	15	22	21
V.	16	15	27	15	17	17	17	16	17	21	16	21	18
VI.	16	17	27	15	17	15	17	16	14	22	15	23	19

character and there were certain mechanical differences in the preparation of lozenges which only those who had tried it could fully appreciate. But surely it was not necessary that these articles should be expunged from the Pharmacopœia. He offered no opinion as to their value as medicaments, but in these days of accuracy in the production of galenical preparations on a large scale and the improved modes in which machinery had been brought to bear, there could surely be no difficulty in the production of lozenges of average weight and of equally distributed medicinal strength. Directly the houses which enjoyed the confidence of the trade in this branch of manufacture had their attention called to these points he had no doubt they would take steps to remove the objections which had been pointed out.

Mr. STROTHER said Mr. Atkins had with one or two slight exceptions perfectly covered the ground. Manufacturers were in this difficulty, they would like to have the opinion of the Conference or of some body which had the confidence of the public as to the actual weight these lozenges should be. One maker, producing a morphia lozenge having the exact amount of the medicament required, would make it 12, 14 or 16 grs. whilst another manufacturer, who also made it accurately, but left out the gum, would make a much larger lozenge, thus placing the first firm in a most awkward position. It would be a great advantage therefore, if a standard weight were fixed for each lozenge. Again, in the case of compound sulphur lozenges, it was easy as possible to make them by employing heat, but in that case the lozenge was completely spoiled, and he feared that a great many were made in that way. If they were dried by wind, there was far more trouble and expense, and a higher price had to be charged, but the lozenges were far more active. If all lozenges were made of a certain weight it would be very easy to test whether they were of the proper strength. If the gentleman who suggested that all the lozenges should be expunged would take a black draught and then a cascara and red currant lozenge he thought he would soon alter his mind.

Mr. BURROUGHS said the difficulty in drying had recently been obviated almost entirely by improvements in drying machines, consisting of blowers used in conjunction with hot-air boxes. The air might be heated by gas underneath the air passage, or by passing through a box in which there were steam-pipes. The hot air when brought over the moist material, dried it much more quickly than any wind, unless it were the hot wind of a desert.

Mr. KNIGHT, referring to the statement that some of the lozenges contained dextrin, said he believed that only two or three houses used that substance. The lozenges were perhaps specially prepared for the stores.

Mr. J. C. UMNEY said he had recently had occasion to examine some carbolic acid lozenges which were stated to have been freshly prepared, but many of them contained only 0·6 grain instead of one grain of the acid. Of course it might be urged that this arose from the volatility of carbolic acid.

The PRESIDENT said the great difficulty in the manufacture of lozenges, even on a small scale, was the drying. It was necessary to begin with a low temperature and gradually increase it; pharmacists could hardly make lozenges unless they had a special drying apparatus. Nothing but good gum arabic should be used; neither dextrin nor Indian gum was admissible. The taste was not at all agreeable if tragacanth was used in any quantity. The thanks of the Conference were due to Mr. Davis for this paper, which would no doubt put lozenge-makers on the *qui vive*, and lead them to improve their manufacture.

A vote of thanks was agreed to.

The next paper read was a—

NOTE ON DISPENSING LIQUOR STRYCHNINE.

BY THOMAS SHEPHEARD.

SOME weeks since I had a prescription which caused me some anxiety, owing to the dangerous nature of the precipitate thrown down some time after its preparation.

The mixture contained an alkaline solution of arsenic, with solution of strychnine, as follows:—

℞ Liq. Fowleri,	
Liq. Strychninæ āā	ʒiiss.
Aq. Distillat. ad	ʒiv.

The fine acicular crystals thrown down led me to suspect that the excess of alkali in the Fowler's solution was the cause.

The addition of a few drops of diluted hydrochloric acid soon dissolved the crystals, which were then kept in solution.

If this note be read as a dispensing note at the coming Conference, it may be a means of preventing a serious mischief to other pharmacists.

The PRESIDENT, who read the foregoing note, said the Conference was indebted to the author for this practical contribution, which might be the means of preventing accidents.

The last paper, in the absence of the authors, was read by Mr. W. A. H. Naylor.

THE SOLVENT ACTION OF ALCOHOL OF DIFFERENT DEGREES OF STRENGTH ON SOME OF THE DRUGS USED IN MAKING PHARMACOPŒIAL TINCTURES.

BY E. H. FARR AND R. WRIGHT,
Pharmaceutical Chemists.

NOTE V.—ON TINCTURE OF HENBANE.

SINCE the publication of our notes on tincture menstrua, read at the last meeting of the Conference, the subject has been more fully investigated, and papers on conium, aconite and jaborandi have been published in the *Pharmaceutical Journal*. The purpose of the present note is to place on record the results obtained in working upon henbane leaves.

Our experiments upon the subject have been conducted upon similar lines to those already recorded in connection with the drugs above-mentioned. The object in view has been three-fold, viz. :—

1. To ascertain the menstruum best adapted for securing perfect exhaustion of the drug.

2. To find by the best methods of estimation available, the average alkaloidal content of carefully prepared tinctures of the drug.

3. To ascertain by experiment what process will yield a tincture containing the maximum amount of alkaloid and extractive.

Twelve specimens of henbane leaves, obtained from different sources, were operated upon. Of these ten were the produce of the second year's biennial, and two that of the annual, plant.

From each specimen of drug a series of tinctures was prepared by the B. P. process with alcohol of 80, 70, 60, 50 and 40 per cent. strength (by volume).

The tinctures as thus prepared varied exceedingly in colour, the stronger menstrua yielding a rich chlorophyll-green coloured tincture, while those prepared with the 50 and 40 per cent. menstrua

were distinctly brown in colour and contained only a small proportion of green colouring matter. All, however, exhibited in a marked degree the characteristic odour of the plant, and in each case there was remarked a tendency to throw down a deposit, which was most abundant in the tinctures prepared with the weaker menstrua.

For the estimation of the alkaloid in the tinctures several processes were tried, two or three of which gave exactly concordant results.

The following was ultimately adopted for the alkaloidal estimations, on account of certain advantages presented in working.

100 c.c. of the tincture to be estimated was introduced into a porcelain dish and evaporated over a water bath, water being added towards the end and evaporation continued until all the spirit was expelled. The residual liquor was allowed to cool, 1 c.c. semi-normal sulphuric acid added, and the solution filtered through cotton wool into a separating funnel. The dish was rinsed with 10 c.c. of chloroform and the rinsings added to the contents of the funnel. After separation the chloroform layer was drawn off and the alkaloidal solution washed with two or three successive portions of chloroform, until all chlorophyll was removed.

The mixed chloroformic solutions were then well shaken with three successive 5 c.c. of acidulated water, which after separation were removed and added to the original solution. The latter was then rendered alkaline by the addition of 2 c.c. B.P. liquor ammoniæ, and shaken with two successive 15 c.c. of chloroform. The chloroformic alkaloidal solutions were drawn off and evaporated, and the residue dried over a water-bath until the weight was constant.

As the resulting product from two or three drugs was not free from colour, it was treated with dilute acid, the residue dried, and the weight deducted from the first result. As in the case of tincture of jaborandi, it was found necessary to get rid of the mucilaginous matter present in the 40, 50, and 60 per cent. tinctures by means of strong alcohol, before proceeding with the estimation of these tinctures. The results are given in Table I.

The amount of extractive was ascertained by evaporating 10 c.c. of the tincture and heating the residue at 100° C. until the weight was constant. From this the required percentage was calculated.

The behaviour of the tinctures on admixture (1) with water and (2) with 90 per cent. alcohol was noted, and the results are stated in Table II. The results there recorded show the appearance

Table I.—*Showing Quantitative Results of Estimation of Tincture of Henbane.*

No. of sample.	Amount of alkaloid in grams from 100 c.c. tincture.					Amount of extractive in grams from 100 c.c. tincture.				
	80 p. c. tincture.	70 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.	40 p. c. tincture.	80 p. c. tincture.	70 p. c. tincture.	60 p. c. tincture.	50 p. c. tincture.	40 p. c. tincture.
1	·006	·008	·008	·006	·008	3·02	3·22	3·58	3·66	3·44
2	·011	·011	·0105	·010	·010	3·98	4·60	4·91	5·26	5·26
3	·015	·015	·0135	·0145	·015	3·12	3·52	3·81	3·88	3·78
4	·009	·010	·009	·009	·0105	2·41	2·64	3·02	3·22	2·98
5	·0095	·010	·0095	·010	·010	1·98	2·48	2·78	2·92	2·98
6	·014	·013	·0145	·013	·013	3·30	3·78	4·12	4·30	4·26
7	·011	·0095	·011	·010	·010	3·08	3·58	3·82	4·06	3·60
8	·009	·010	·009	·0095	·009	3·10	3·50	3·68	3·68	3·40
9	·012	·012	·012	·013	·013	3·42	3·68	3·72	3·84	3·50
10	·011	·011	·012	·011	·011	2·70	3·10	3·42	3·48	3·18
11	·009	·008	·009	·008	·008	2·14	2·54	2·76	2·94	3·12
12	·008	·0085	·008	·0085	·008	2·56	2·73	2·82	2·97	3·24
Average . . .	·0104	·0105	·0103	·0102	·0104	2·90	3·28	3·52	3·68	3·56
Root	·0085	·0098	·0098	·0108	·0108	·946	1·06	1·24	1·46	1·51

The above results represent the mean of two estimations in each case.

The series of tinctures marked Nos. 11 and 12 were made from the leaves of the annual plant.

Table II.—*Showing Results obtained on Mixing the Samples of*

No.	Result when 1 vol. of tincture is mixed with 3 vols. alcohol.				
	90 per cent. tincture.	70 per cent. tincture.	60 per cent. tincture.	50 per cent. tincture.	40 per cent. tincture.
1	Clear, sl. flo. ppt.	Opalescent, then clear, with sl. flo. ppt.	Cloudy, then clear with b'ky fl. ppt.	Cloudy, then clear with b'ky fl. ppt.	Cloudy, then clear with b'ky fl. ppt.
2	Clear, sl. flo. ppt.	Cloudy, then opalescent sl. flo. pp.	Cloudy, then opalescent with flocc. ppt.	Turbid, then opalescent with flocc. ppt.	Turbid, then clear with b'ky fl. ppt.
3	Clear, sl. flo. ppt.	Ft. opal., then clear, with sl. flo. ppt.	Cloudy, then clear with flocc. ppt.	Cloudy, then clear with flocc. ppt.	Cloudy, then clear with flocc. ppt.
4	Clear, very sl. flo. ppt.	Sl. opal., then clear, with sl. flo. ppt.	Cloudy, then clear with mucil. dep.	Opaque, then clear with mucil. dep.	Opaque, then clear with mucil. dep.
5	Clear, very sl. flo. ppt.	Opaque, then clear, with sl. mucil. deposit.	Opaque, then clear with mucil. dep.	Opaque, then clear with mucil. dep.	Opaque, then clear with mucil. dep.
6	Clear, very sl. flo. ppt.	Cloudy, then clear, with mucil. deposit.	Cloudy, then clear with mucil. dep.	Cloudy, then clear with mucil. dep.	Turbid, then opalescent with mucil. deposit.
7	Clear, very sl. flo. ppt.	Opalescent, then clear, with sl. flo. ppt.	Cloudy, then clear with flocc. ppt.	Cloudy, then clear with b'ky fl. ppt.	Cloudy, then clear with b'ky fl. ppt.
8	Clear, and remains so.	Very faint opalescence then cloudy with sl. flo. ppt.	Cloudy, opal., then slight flocc. ppt.	Cloudy, then flocc. ppt.	Cloudy, then clear with flocc. ppt.
9	Clear, very sl. flo. ppt.	Opalescent, then clear, with mucil. ppt.	Cloudy, then clear with mucil. ppt.	Cloudy, then clear with mucil. dep.	Turbid, then opalescent with mucil. deposit.
10	Clear, very sl. flo. ppt.	Opalescent, then cloudy with sl. flo. ppt.	Opalescent, then clear with flocc. ppt.	Cloudy, then clear with flocc. ppt.	Cloudy, then cloudy with flocc. ppt.
11	Clear, no ppt.	Clear, faint, flocc. ppt.	Opalescent, slight flocc. ppt.	Cloudy, then clear with flocc. ppt.	Cloudy, then clear with flocc. ppt.
12	Clear, sl. gel. ppt.	Clear, slight gel. ppt.	Opalescent, slight gelat. ppt.	Cloudy, then gelat. ppt.	Cloudy, then gelat. ppt.

Tincture with Water, and with 90 % Alcohol respectively.

No.	Result when 1 vol. of tincture is mixed with 2 vols. water.				
	80 per cent. tincture.	70 per cent. tincture.	60 per cent. tincture.	50 per cent. tincture.	40 per cent. tincture.
1	Turbid, then turbid, with green waxy ppt.	Turbid, then cloudy, with green waxy ppt.	Turbid, then turbid with slight waxy ppt.	Cloudy, then cloudy, with slight deposit.	Opalescent, then opal., with slight flocc. ppt.
2	Turbid, then cloudy with green deposit.	Turbid, then cloudy, with green deposit.	Turbid, then cloudy, with slight waxy dep.	Turbid, then turbid, with slight green deposit.	Turbid, then turbid, with very slight flocc. deposit.
3	Turbid, no deposit.	Turbid, very slight deposit.	Turbid, very slight deposit.	Cloudy, slight dep.	Opalescent, then clear, with slight flocc. ppt.
4	Turbid, no deposit.	Turbid, no deposit.	Turbid, no deposit.	Turbid, then opalescent, with grey ppt.	Cloudy, then clear, with grey ppt.
5	Cloudy, no deposit.	Cloudy opalescent, with sep. of resin.	Opalescent, then turbid, with sep. of resin.	Slight opalescent then cloudy.	Clear.
6	Turbid, then cloudy with green deposit.	Turbid, then opalescent, with green deposit.	Turbid, then cloudy, with sep. of resin and chlorophyll.	Turbid, no deposit.	Cloudy, then clear, with flocc. ppt.
7	Turbid, then turbid with green waxy ppt.	Turbid, then turbid, with waxy ppt.	Turbid, then cloudy, with green waxy ppt.	Cloudy, then cloudy, with green deposit.	Cloudy, opalescent, opalescent with slight green ppt.
8	Turbid, then turbid with green waxy ppt.	Turbid, cloudy with green waxy ppt.	Cloudy, cloudy with slight green deposit.	Cloudy, opalescent, with green deposit.	Cloudy, opalescent, cloudy, with faint green deposit.
9	Turbid, then cloudy, with green deposit.	Turbid, then opalescent, with green deposit.	Turbid, then cloudy, with green separation.	Turbid, cloudy with green ppt.	Cloudy, then clear, with fl. ppt.
10	Turbid, then cloudy, with waxy ppt.	Turbid, then cloudy, with waxy ppt.	Turbid, then cloudy, with waxy ppt.	Cloudy, then cl. with slight ppt.	Cloudy, then cloudy, with slight ppt.
11	Milky opalescent, no deposit.	Milky opalescent, no deposit.	Cloudy, opalescent, no deposit.	Cloudy, opalescent, no deposit.	Opalescent, no deposit.
12	Milky opalescent, no deposit.	Milky opalescent, no deposit.	Cloudy, opalescent, no deposit.	Cloudy, opalescent, no deposit.	Cloudy opalescent, no deposit.

Table III. Showing Results of Experiments on Process for Making Tincture.

	Alkaloid per cent.				Extractive per cent.			
	By simple maceration.	By double maceration.	By B.P. process.	By continuous percolation.	By simple maceration.	By double maceration.	By B.P. process.	By continuous process.
No. 1. . .	·0135	·014	·014	·016	3·68	4·03	4·22	4·66
No. 2. . .	·012	·013	·113	·018	3·20	3·34	3·74	3·92

presented immediately after mixing the liquids and also after standing twelve hours.

In addition to the tinctures of commercial samples of henbane leaves we also prepared, for the sake of comparison, with a 60 per cent. menstruum (1) a tincture of the fresh seeds, (2) a tincture of recently dried fresh leaves, and (3) a tincture of the dried cortical portion of the root, the proportion of ingredients being the same as in the B.P. tincture. The estimation of alkaloid in these tinctures showed the following results:—

1. Tincture from the seeds 100 c.c. = '015 gr. alkaloid.
2. Tincture from the leaves 100 c.c. = '013 „ „
3. Tincture from root-bark 100 c.c. = '020 „ „

A complete set of tinctures was also made from another sample of dried fresh root, obtained in June. The same proportion of root was used and the alkaloid and extractive in each tincture estimated. The results are appended to Table I.

From the results shown in Table I. it is evident that perfect exhaustion of the drug may be effected by the use of either a strong or dilute alcohol, the results coming out very closely concordant. This is probably due to the small amount of alkaloid present in the leaves.

In fixing upon a 50 per cent. menstruum for use in our experiments upon the process to be followed in making the tincture, we have relied mainly upon the acknowledged fact that it is desirable to exclude chlorophyll from a tincture where this can be accomplished without any loss of medicinal activity; and partly also upon the fact that this preparation is largely employed in the treatment of a class of diseases in which the presence of mucilaginous matters would seem to be of service.

It will be seen on reference to Table I. that the percentage amount of extractive yielded by tinctures prepared with this menstruum is higher than that yielded by the tinctures prepared with other menstua.

The average amount of alkaloid contained in the tinctures is about '01 per cent., and as it is desirable that a standard of alkaloidal strength should be fixed for the tincture, we are prepared to recommend that the above percentage should be taken as the standard.

For the purpose of our experiments upon alternative processes, two good samples of the leaves were selected and treated by the following processes with a 50 per cent. menstruum:—

1. An ounce of the leaves in No. 20 powder was macerated for

seven days with frequent agitation. The fluid portion was then strained off and the marc submitted to pressure. The amount of menstruum required to make the volume up to 8 fluid ounces was then poured over the marc, which was again submitted to pressure and the expressed liquids mixed and made up to 8 fluid ounces and the whole filtered.

2. An ounce of the leaves in No. 20 powder was macerated with 4 ounces of menstruum for forty-eight hours and the fluid portion separated by pressure. The marc was then macerated with the remainder of the menstruum for twenty-four hours and the tincture again expressed. The expressed liquids were then mixed and enough spirit poured on the marc to make up the total volume, after the final expression, to 8 fluid ounces.

3. The B.P. process, maceration and percolation, displacing the last portion of the spirit.

4. An ounce of the leaves in No. 20 powder was moistened with 2 fluid drachms of menstruum and packed in a conical percolator, menstruum was then added and percolation allowed to continue continuously, but slowly, until 8 fluid ounces of percolate had been collected.

The tinctures thus prepared were estimated, with the results shown in Table III.

From the results obtained it is evident that the whole, or practically the whole, of the alkaloid is extracted by each of the processes, while the greatest amount of extractive matter is taken out by the process of continuous percolation.

The PRESIDENT said this was a continuation of the authors' researches on tinctures of the B.P. containing certain definite alkaloids. It was very desirable that those which were very active, like preparations of opium, nux vomica, belladonna, henbane and so on, should be of uniform strength. The aim of the authors was to ascertain the most suitable strength of spirit in each case and the best process of working by percolation, percolation and maceration, or maceration only. They recommended a spirit of 50 per cent. strength, or about proof spirit, still to be used for henbane. It was just on the border line whether a spirit of that strength would hold the chlorophyll of the henbane leaf in solution or not; for a tincture so made and exposed to light deposited a great deal. He had sometimes thought it might be an advantage to use a somewhat stronger spirit, but they went on the other line and suggested that it might be advisable to leave out the chlorophyll and get

more mucilaginous matter present in the tincture. Perhaps they were right, as this preparation was generally used in diseases in which the presence of mucilage would probably be an advantage.

Mr. PETER MACEWAN said there could be no question that Messrs. Farr and Wright were doing one of the best pieces of work which had been done in pharmacy of late years, but it was a question whether the Conference was at present prepared to discuss all that they had done during the year. He would suggest that next year, if their work was completed, they might present a *résumé* of all the papers, and there might then be a general expression of opinion upon it; after which the Pharmacopœia authorities might see their way to adopt some of the conclusions arrived at.

Mr. GERRARD supported the suggestion that weaker spirit should be used in the exhaustion of henbane, as he knew it was efficient. It had been the practice of many pharmacists to consider that a tincture of a bright green colour which gave a certain turbidity to water was the best, but such characteristics were really no evidence that it was a good preparation. The turbidity might simply show that it contained a little excess of chlorophyll, which was precipitated on dilution. By using a weaker spirit a tincture was produced which remained bright on dilution; and for his own part he should prefer a tincture so made to one which gave an unsightly precipitate.

The PRESIDENT moved a vote of thanks to the authors, which brought the discussion of the papers to a close.

GENERAL BUSINESS.

Presentation from the Bell and Hills Fund.

The PRESIDENT said one of the official duties devolving upon him was the presentation of books to the town where the Conference met from the Bell and Hills Fund, which was founded by Mr. T. H. Hills in memory of Jacob Bell, and yielded about £10 annually. Unfortunately, Mr. Hills was a great invalid at the present time, but for many years he took an active part in the Conference meetings. The books would be deposited in the Free Library, where they could be consulted by all the chemists in the district, as, unfortunately, there was as yet no society or association of chemists in the town which could take charge of them. Having read the titles of the ten volumes he formally presented them to Mr. Munday.

Mr. MUNDAY thanked the President for the gift, which he said would be a memento of the visit of the Conference. The chemists of Cardiff and the district had not hitherto had a local association, but this meeting had brought them together a good deal, and he ventured to state that before long a local association would be formed. They thought it would be far better to place these books in the Free Library, where they could always be available, rather than to keep them in some room where they might meet only occasionally, and where they would be difficult of access. It was their intention to augment the number of books by degrees, and by the time the Conference again visited Cardiff he hoped they would have a good library.

Mr. BALLINGER, Librarian, formally accepted the charge of the books, but left it to Mr. Peter Price, Chairman of the General Committee, and the Rev. Mr. Winks, Chairman of the Books Subcommittee, to say anything which might be necessary.

Mr. PRICE said his duty was simply to accept very cordially the custody of the books, until such time as the chemists had an institution of their own in which to place them, and to promise to take every care of them. The only condition he was compelled to impose was, that they should be open to the inspection of any one who wished to see them; though he did not imagine there would be much demand for them, except on the part of chemists and their pupils and assistants.

The Rev. Mr. WINKS added a few words, expressing the hope that these books would form the nucleus of a large library, which would be of great advantage to the chemists in the neighbourhood.

The PRESIDENT said he at once accepted the condition named by Mr. Price.

Mr. MUNDAY said the books would be placed in the Reference Library, and it was not intended that they should be removed.

The Unofficial Formulary Committee.

Mr. SOUTHALL proposed the re-appointment of the Formulary Committee for the ensuing year. The gentlemen composing it had done good work in the past, and would no doubt continue to do so.

Mr. GERRARD seconded the motion. Before this Committee was appointed many of them were often travelling in different paths in endeavouring to arrive at the same end; and necessarily they sometimes went astray. Thanks to the Committee their path was being made plain, to the comfort and convenience of everybody.

The motion was carried unanimously.

The PRESIDENT said the Committee had not done much during the past year, but what little had been done he hoped had been done well, and that it met with the approval of their colleagues of the Conference and of medical men.

The names of the members of the Committee are, Mr. W. Martindale (Chairman), Mr. W. A. H. Naylor (Secretary), and Messrs. A. C. Abraham, T. Greenish, T. B. Groves, T. Maben, N. H. Martin, F. Ransom, R. Reynolds, C. Symes, and R. Wright.

Place of Meeting for 1892.

Mr. PETER BOA said he had been deputed by a very representative meeting of the chemists of Edinburgh, also including a number of other gentlemen closely connected with pharmacy and science, such as Professor Crum Brown, Professor T. R. Fraser, Dr. Ralph Stockman and Dr. J. E. T. Aitchison, C.I.E., to give a very cordial invitation to the Conference to meet at Edinburgh in 1892. As there was some uncertainty about the exact date at which the British Association would meet next year, he was instructed to say that whatever date would suit the Conference would be made convenient by the Committee. He thought Edinburgh would form a pleasing contrast to Cardiff, where everything almost was new, including the new dock, which they were told was the finest in the world. In Edinburgh nearly everything was ancient, but they could show a new bridge, which also was the finest structure of the kind in the world.

Mr. MASON asked what time the British Association would meet next year.

The PRESIDENT said he believed towards the end of September, but it was not definitely fixed.

Mr. DOTT cordially supported the invitation from Edinburgh, as to the merits of which Mr. Boa had not expatiated in such detail as was usual on these occasions, probably because the attractions of Edinburgh were so well known. Probably towards the end of September would be found the most convenient time.

Mr. NAYLOR moved that the invitation so cordially presented on behalf of their Scotch friends be as cordially accepted.

Mr. MASON, in seconding the motion, said the previous meeting of the Conference in Edinburgh had been a red-letter day to him, and he should look forward with much pleasure to another visit to the modern Athens.

The motion was carried unanimously.

Mr. PAYNE said it had been discussed on more than one occasion

whether it was advisable that the Conference should always follow the British Association, and it seemed to him this was a very opportune time for considering the question again. He would suggest, therefore, that at the next meeting of the Conference the question should be thoroughly discussed.

Mr. MASON remarked that the British Association followed the Conference.

The PRESIDENT said the question raised by Mr. Payne was informally discussed last year, but in the absence of any general expression of opinion, either by members personally or in the press, it was not considered advisable to change. Next year a larger meeting might be looked for, and it might be well then to discuss the subject.

Mr. PAYNE said he would give notice of the following motion for next year:—

“That in future the Conference do not meet in the same town or at the same time as the British Association.

The PRESIDENT said he had been endeavouring to ascertain the feeling amongst members of the Executive and others, old members of the Committee, on this subject, and he thought the general desire was that the present system should be continued. There were advantages and disadvantages on each side, which it would take a long time to discuss, but he saw no objection to putting down the motion for consideration next year.

Mr. MASON suggested that the motion as read was rather strongly worded, and that possibly Mr. Payne might somewhat modify it if he were allowed to send it in later.

Dr. RIDEAL said it would be open to amendment when it was brought on.

Mr. PAYNE said he wished the question thoroughly debated, and thought it better to bring forward a definite resolution. If any amendment were proposed which met the views of the members generally he should be ready to accept it; but in the meantime he thought it had better remain as it was.

ELECTION OF OFFICERS.

Mr. NAYLOR (Hon. Sec.) read the following list of officers submitted by the Executive:—

President.—E. C. C. Stanford, F.I.C., F.C.S., Dalhmuir.

Vice-Presidents—M. Carteighe, F.I.C., F.C.S., London; W. Gil-

mour, F.R.S.E., Edinburgh; Dr. Thresh, Chelmsford; and J. R. Young, J.P., Edinburgh.

Hon. Treasurer.—R. H. Davies, F.I.C., F.C.S., London.

Hon. General Secretaries.—W. A. H. Naylor, F.I.C., F.C.S., London; and F. Ransom, F.C.S., Hitchin.

Members of Committee.—D. B. Dott, F.R.S.E., Edinburgh; A. W. Gerrard, F.C.S., London; Professor Green, M.A., B.Sc., London; Alfred Coleman, Cardiff; J. Hodgkin, F.I.C., F.C.S., London; E. M. Holmes, F.L.S., London; W. Kirkby, F.L.S., F.R.M.S., Manchester; J. Munday, Cardiff; and J. L. Ewing, Edinburgh.

Auditors.—D. Anthony, Cardiff; and Thomas Thompson, Edinburgh.

Hon. Local Secretary.—Peter Boa, Edinburgh.

Mr. MASON said it was not usual to make any comments on this part of the business, and he felt some delicacy in saying anything, but he must express the disappointment which he was sure would be shared by many others, at not seeing Mr. Martindale's name again put down for President.

The PRESIDENT thanked Mr. Mason for the suggestion and his friends for the way in which they had received it; but there were several considerations which rendered it desirable that another President should be chosen for the Edinburgh meeting. Mr. Stanford was not only resident in Scotland, but was one of the founders of the Conference, and in its earlier days took great interest in its meetings. He had that *suaviter in modo* which was so agreeable to all, and he was quite sure that in him the Conference would have a thoroughly worthy and efficient President.

Mr. PAYNE said he desired to move an amendment. For the last two years there had been an omission, which he believed was unintentional, from the Executive Committee of any gentleman from the country he represented. He was sure there was no intention to boycott them, and he would therefore move as an amendment that the name of Mr. W. F. Wells, Dublin, a gentleman who frequently attended the Conference, should be added to the Executive.

Mr. MACEWAN said Ireland had a magnificent representative in the person of Mr. Carteighe, the first Vice-President.

The PRESIDENT thought it would be somewhat irregular to press the amendment. He was quite sure there was no intention to do injustice to Ireland, and up to two years ago there had always been a representative from the sister island; probably it was an

oversight. But the list was now complete, and it would be rather invidious to strike out one of the names already selected. If Mr. Payne would withdraw the amendment, he was sure next year the omission would be repaired.

Mr. Payne said he should have much pleasure in withdrawing the amendment after such conciliatory assurances from the President.

The list of officers was then agreed to unanimously.

VOTES OF THANKS.

Mr. HODGKIN moved—

“That the cordial thanks of the non-resident members of the British Pharmaceutical Conference be given to the local Committee, especially to Mr. Coleman, Mr. Munday, Alderman Yorath, and Mr. Anthony, for their kindness in carrying out the arrangements connected with the visit of the Conference to Cardiff.”

He was sure this resolution expressed the feelings of all who had profited by the arrangements already made, and who hoped to enjoy still more the splendid excursion which had been arranged for the following day.

Mr. J. C. UMNEY seconded the motion very cordially, and it was at once put and carried unanimously.

Mr. COLEMAN, in responding, said he was very grateful to them all for their kind vote of thanks, and he hoped the Local Committee had not been altogether unsuccessful in their efforts to please. But there were two reasons why he wished to respond briefly on this occasion. In the first place he was reminded that their labours and duties were by no means ended, and bearing in mind some little difficulties they had met with on the previous evening, it would be as well to remember the proverb, “Never halloo until you are out of the wood.” In the second place he was anxious to start the party for Caerphilly Castle, where they anticipated a pleasant evening would be spent. He trusted they would enjoy themselves, and when they left Cardiff would carry away with them pleasant recollections of the town and of its inhabitants.

Mr. MUNDAY (Chairman of the Local Committee) also thanked the Conference for the appreciation it had shown of the Committee's endeavours. The work had been a very pleasurable one, and he should look forward with delight to the time when a second visit would be paid to Cardiff.

Mr. CONROY moved a vote of thanks to the Mayor and Corporation of Cardiff for their kindness in allowing the use of the Assembly Rooms at the Town Hall for the purpose of the *Conversazione* on Monday evening.

Mr. R. H. DAVIES seconded the motion, which was carried unanimously.

Mr. MOSS moved a similar vote of thanks to Principal V. Jones and Council of the University College of South Wales and Monmouthshire, for granting the use of the lecture theatre for the purpose of the Conference. It would be difficult to find a room better suited for the purpose, and he moved the resolution most heartily. He might express a friendly hope that the projected extension of the University might soon be an accomplished fact, and that in view of the local association of pharmacists at which Mr. Munday had hinted being established, it might be found practicable to make arrangements in connection with the College, to facilitate the formation and growth of such a society.

Mr. PAYNE seconded the motion, which was endorsed by the President, and carried unanimously.

Mr. ATKINS said the reign of the President had now come to a conclusion for the present, but the remarks of Mr. Mason would not be forgotten, and they would probably see Mr. Martindale in the same position on some future occasion. He had now to propose a hearty vote of thanks to him for his services, and he only regretted that time did not allow of his enlarging upon it. The resolution was—

“That the hearty thanks of the Conference be accorded to the President for the ability and courtesy with which he has discharged the duties of that office, and conducted the business of the meeting.”

As to either the ability or the courtesy of the President it was not necessary to say a word. He was *facile princeps* amongst pharmacists and his courtesy and urbanity were equally marked.

Mr. T. TYRER, in seconding the motion, emphatically endorsed all that had been said by the mover. His conduct of the meetings and his apposite remarks during the discussion of the papers, had been all that could be desired, and succeeding Presidents could not do better than take him for an example.

The motion was carried by acclamation.

The PRESIDENT, in responding, thanked the members very heartily for their kindness and assured them he was very conscious

of his own deficiencies ; but he had done his best, and was glad to find he had not altogether failed.

EXCURSION.

At 9.15 on Thursday morning about one hundred and fifty members of the Conference started from the Great Western Station in saloon carriages for Lydney, *via* Newport and Chepstow. From Lydney they were conveyed in carriages to Scoules' Iron Mines, through the Forest of Dean. After an hour's inspection of the mine and its surroundings, the journey was resumed to Speech House, where an excellent luncheon was served at 1.30 p.m. After a good repast, Mr. Martindale proposed "The Health of the Ladies' Entertainment Committee," coupling the names of Mrs. Coleman and Mrs. Sanders with the toast.

Mr. Coleman, in reply, said it had afforded his wife great pleasure to do her share.

Mrs. Sanders, in a very neat little speech, expressed her thanks for the compliment.

Mr. Martindale proposed the "Local Committee," particularly Messrs. Munday, Coleman, Hicks, Anthony, and Alderman Yorath.

Mr. Munday said that it had been a very pleasant task to them, and he was sorry that the meeting was drawing to a close.

Messrs. Coleman, Hicks, and Yorath replied on behalf of the Local Committee, and expressed the gratification that they felt at the visit of the Conference.

To the toast of "The Ladies," Mr. J. C. Umney, who was called upon to reply, did so in a very felicitous manner, after which the journey was resumed for Symonds Yat, on the Wye. Hitherto the scenery had been good, but now a district was entered whose magnificence few but those who have visited it can conceive. The Wye is a tortuous stream, of which magnificent double views are to be seen, and in one stretch of 600 yards the river winds some two miles.

Having taken tea, which was provided at Roch Lea House on the banks of the river, the party returned by special train through Monmouth and Tintern to Cardiff, arriving at 8.40 p.m.

A fruit Concert was arranged at the Angel Hotel, which was attended by the members and their friends—a fitting termination to a most enjoyable day.

On Friday morning a party of about thirty met at the Angel Hotel at 10.30 a.m., and were conveyed from there by brake to the Dowlais Iron Works. After a thorough inspection of these works, the party was conducted to the Tharpsis Copper Works. The whole process of treatment of the ore was shown and explained, after which the adjoining Tin Stamping and Enamel Works were visited, thus completing a pleasant and instructive visit.

RECEPTION AND CONVERSAZIONE.

On Monday evening, at the invitation of the Local Committee, a Reception by the President and other officers of the Conference was held at the Cardiff Town Hall. The company was received by Mr. and Mrs. Martindale, on whose right were the Right Hon. The Marquis of Bute, Mayor of Cardiff, in his robes of office, and the Marchioness of Bute, supported by Mr. John Munday. This was followed by a concert under the direction of Mr. Jacob Davies, the accompanist being Madame Clara Davies. The programme which was an attractive one, and included Welsh airs and a harp solo, was gone through with much spirit. The rounds of applause which the music, both vocal and instrumental elicited, bespoke an appreciative and delighted audience.

Light refreshments were provided by the local committee in an ante-room.

An exhibition of microscopic objects and others of scientific interest were provided in an adjoining room, also a fine display of local photographic views.

The attendance of visitors was large, notwithstanding the inclement weather, and the entertainment was a complete success.

INDEX.

A.

Acacia Decurrens, 207.
Acacia Tenerrima, 184.
Acaroides Resinifera, 210.
Acarus Farinæ, 232.
Acarus Lini: F. Davis, 231.
Acarus Sacchari, 231.
Acetanilid, 75, 76.
Acetic and Butyric Acids, Estimation of Formic Acid in the presence of: A. Scala, 123.
Acetic Fermentation, Action of Light on: M. Giunti, 105.
Acetoamidophenol, 75.
Aceto-Anisidin, 75.
Acetone, Estimation of, in Urine: H. Huppert, 120.
Aceto-Phenetidin, 75.
Acetophenone, 76.
Acetphenylhydrazide, 76.
Acetyldigitogenin, 66.
Acidimetry, Alkalimetry and Iodometry, Potassium Iodate as a Standard for: M. Gröger, 140.
Acidum Salicylicum Purificatum, 30.
Aconite and its Productions, Suggestions for the Assay of: A. H. Allen, 451.
Aconite, Japanese, called Kusu-Uzu: A. Lubbe, 157.
Aconite, Japanese, called Shirakawa-Bushi: O. Lezius, 157.
Aconites and Aconitines, The: E. Richards and F. A. Rogers, 45.
Aconitic Acid, Synthesis of: L. Claisen and E. Hori, 78.
Aconitine, 458.
Aconitine: A. Lubbe, 44.
Aconitum Chinense, 157.
Aconitum Ferox, 457.
Aconitum Lycocotum, 458.
Aconitum Napellus, 157.
Aconitum Napellus, Crystalline Alkaloid of: W. R. Dunstan and W. H. Ince, 43.

Aconitum Paniculatum, 459.
Aconitum Sinense, 44.
Acqua, G.: Formation of Raphides in *Phytolacca Dioica*, 189.
Acraspis Erinacei, 188.
Actinodaphne Procera, 43.
Adcock, H. D.: *Tinctura Quiniæ Ammoniata*, 254.
Address, The President's, 369.
Adermann, F.: The Alkaloids of *Corydalis Cava*, 62.
Agaric Acid, Therapeutic Action of: M. Combemale, 249.
Ahrens, F. B.: *Sparteïne*, 61.
Ahrens, F. B.: *Veratrine*, 56.
Albin, M., and M. Cadéac: Poisonous Properties of the Oil of Sage (*Salvia Officinalis*), 219.
Albizzia Saponaria, 184.
Albumen, Action of Glycerine on V. Grandis, 110.
Albumen and Globulin in Urine: D. Noel Paton, 114.
Albumen, free from Ash: E. Harnack, 109.
Albumen, New Test for, in Urine: A. Jolles, 118.
Albumen, Note on Solution of: R. A. Cripps, 268.
Albumen, The Ferrocyanide Test for, in Urine: A. Jolles, 119.
Albumen, Volumetric Estimation of, in Urine: F. Venturoli, 118.
Albuminate of Quinine: M. Tarozzi, 51.
Albuminoids, Effect of Saccharin on the Digestion of: A. Stutzer, 113.
Alcohol, Approximate Estimation of, in Tinctures: J. F. Liverseege, 255.
Alcohol, Detection of Impurities in: E. Mohler, 129.
Alcohol, Detection of, in Commercial Ethyl-Ether: T. Poleck and K. Thümmel, 130.

- Alcohol of Different Degrees of Strength, The Solvent Action of, on some of the Drugs used in making Pharmacopœial Tinctures: E. H. Farr and R. Wright, 253, 495.
- Alcohol, the Supposed Hydrates of: S. U. Pickering, 27.
- Alcoholic Fermentation of Invert Sugar: U. Gayon and E. Dubourg, 105.
- Aldehyde, Test for: L. Crismer, 129.
- Aldepalmitic Acid, A new Constituent of Butter Fat: J. A. Wanklyn, 88.
- Aletris Farinosa, 159.
- Algarobilla and Myrobalams, The Tannins of: G. Zoelfell, 68.
- Alkalies, Estimation of, in Presence of Sulphites: J. Grant and J. B. Cohen, 141.
- Alkalimetry, Acidimetry, and Iodometry, Potassium Iodate as a Standard for: M. Gröger, 140.
- Alkaloid, A New, from Conium Maculatum: E. Merck and A. Ladenburg, 46.
- Alkaloid, Crystalline, of Aconitum Napellus: W. R. Dunstan and W. H. Ince, 43.
- Alkaloid in Tylophora Asthmatica: D. Hooper, 165.
- Alkaloid, The Volatile, of Ipecacuanha: E. M. Arndt, 56.
- Alkaloidal Constituent in Valerian Root: M. Waliszewski, 161.
- Alkaloids, Ferrocyanides of: H. Beckurts, 33.
- Alkaloids, Mydriatic, The Mercuric Test for: A. W. Gerrard, 128.
- Alkaloids of Areca Nut: E. Jahns, 61.
- Alkaloids of Belladonna: O. Hesse, 34.
- Alkaloids of Corydalis Cava: F. Adermann, 62.
- Alkaloids of the Pea and Vetch: E. Schulze, 62.
- Alkaloids of the Rhizome of Veratrum Album: C. Pehkschen, 57.
- Alkaloids of the Rhizome of Veratrum Album: G. Salzberger, 58.
- Allen, A. H.: Note on the Constitution of certain Antipyretics and Allied Bodies, 74.
- Allen, A. H.: Suggestions for the Assay of Aconite and its Productions, 451.
- Almonds, Bitter, Test for the Purity of Essential Oil of: J. Morpurgo, 221.
- Aloe Barbadensis, 202.
- Aloe Chinensis, 202.
- Aloe Ferox, 202, 204.
- Aloe Littoralis, 202.
- Aloe Platylepis, 203, 204.
- Aloe Succotrina, 203, 204.
- Aloe Vera, 202.
- Aloes, Curaçoa: E. M. Holmes, 202.
- Aloes, Examination of Specimens of South African: J. Bainbridge, 204.
- Aloes, Natal: E. M. Holmes, 203.
- Aloes, Natal, Notes on: J. M. Wood, 202.
- Aloins, The: F. X. Moerk, 205.
- Alstoea (Blaberopus) Villosa, 185.
- Alumina, Estimation of, in Bread: W. C. Young, 135.
- Aluminium and Iron Sesquioxides, Relative Basicity of: E. A. Schneider, 23.
- Ammonia and Nitrous Acid, Formation of, from Free Nitrogen: O. Loew, 22.
- Ammoniacal Fermentation of Uric Acid: F. and L. Sestini, 115.
- Ammonium Nitrite, Catalytic Decomposition of: O. Loew, 21.
- Amygdalus, 186.
- Anagallis Arvensis: A. Schneegans, 166.
- Andres, H.: Russian Oil of Peppermint, 219.
- Andrews, L. W.: Detection of Coniine in a case of Poisoning, 125.
- Andropogon Citratus, 215.
- Andropogon Nardus, 215.
- Andropogon Schœnanthus, 215, 219.
- Angelic and Tiglic Acids, Derivatives of: P. Melikoff and P. Petrenko-Krittchenko, 81.
- Anilidoacetic Acid (Phenylglycocine), Synthesis of Indigo from: L. Lederer, 71.
- Anogeissus Latifolia, 410.
- Anticholerica Rumphii, 183.
- Antidote to the Poison of the Rattlesnake: F. D. Kelsey, 199.
- Antifebrin, 75, 76.
- Antifebrin and Phenacetin, Separation of: H. Will, 128.
- Antifebrin, Phenacetin and Exalgin in Neuralgia: T. P. Thomson, 274.
- Antifebrin, Tests for the Purity of: E. Ritsert, 128.

Antikamnia: F. Goldmann, 276.
 Antikamnia: F. W. Haussmann, 275.
 Antipyretics and Allied Bodies, Note on the Constitution of certain: A. H. Allen, 74.
 Antipyretics, Two New: E. Münzer, 235.
 Antipyrine, 75.
 Antipyrine and Mercuric Chloride: M. Petsche, 73.
 Antipyrine and Quinine, Valerianates of, as Remedial Agents: M. Sochaczewski, 275.
 Antiseptic Mouth Wash, 282.
 Antiseptol, or Iodo Sulphate of Cinchonine: P. Yvon, 276.
 Antithermin, 76.
 Antze, P.: *Lolium Temulentum*, 179.
 Aconitine, 44.
Aperula, 43.
 Apocynæ containing Alkaloids, occurring in the Dutch Indies, 184.
 Apomorphine and Apocodeine as Expectorants: W. Murrell, 243.
 Apyonin: A. Petit, 275.
 Arabinose, 122.
 Arbenz, C.: Phenylsalicylic Acid, 31.
 Arbol del Peru, 183.
Areca Nut, The Alkaloids of: E. Jahns, 61.
 Arecaidine, 61.
 Arecaïne, 61.
 Arecoline, 61.
 Aristol Plasters: M. Cavaillès, 282.
Aristolochia Reticulata, Volatile Oil of: J. C. Peacock, 214.
 Arnaud, A., and E. Grimaux: Transformation of Cupreine into Quinine, 51.
 Arndt, E. M.: Assay of *Ipecacuanha Root*, 164.
 Arndt, E. M.: The Volatile Alkaloid of *Ipecacuanha*, 56.
 Arrow Poison of the Pigmies: Surgeon Parke and E. M. Holmes, 196.
 Arsenic, Bettendorf's Reagent for: H. Warnecke, 153.
 Arsenic, Estimation of, by Marsh's Method: B. Kühn and F. Saeger, 152.
 Arseniuretted Hydrogen, Action of, on Potassium Permanganate: D. Tivoli, 24.
Artemisia Frigida: F. A. Weiss, 177.

Arthus, M., and C. Pagès: Chemical Theory of the Coagulation of Blood, 107.
 Asafoetida, Constituents of Commercial: W. A. Puckner, 211.
 Asafoetida, Essential Oil of: F. W. Semmler, 213.
Asagraea Officinalis, 195.
 Aschoff, C.: Importance of Chlorine in the Plant, 106.
Asclepias Vomitoria, 165.
 Aspergillin, A Vegetable Hæmatin: G. Linossier, 107.
Aspergillus Niger, 107.
Aspidium Felix Mas, the Rhizome of: J. B. Nagelvoort, 158.
Astragalus, 180.
Astragalus Mollissimus, 180.
 Astre, C.: Bismuth Potassium Iodides, 26.
 Atropamine: O. Hess, 35.
 Atropine and Cocaine, The Relation between: A. Einhorn, 33.
 Atropine, Detection of, in Forensic Investigations: F. Ciotto and P. Spica, 124.
 Atropine Ferrocyanide, 33.
 Aubin, E., and J. Quenot: Estimation of the Total Nitrogen in Manures, 145.
 Aweng, E.: Pomegranate Root Bark, 169.
 Azoimide (Hydrogen Nitride): T. Curtius, 19.
 Azoimide (Hydrogen Nitride): T. Curtius and R. Radenhausen, 20.

B.

Bainbridge, J.: Examination of Specimens of South African Aloes, 204.
 Balland, M.: Glycerine Suppositories, 285.
 Balsams, Excretion of, in the Urine: R. Stockman, 116.
 Balsams, Gum-Resins and Resins: M. Bamberger, 212.
 Balzer, M.: Detection of Mineral Acids in Vinegar, 135.
 Bamberger, M.: Gum-Resins, Resins and Balsams, 212.
 Barium and Strontium, Quantitative Separation of: R. Fresenius, 148.
 Barium Group, Qualitative Analysis of the: C. Lüdeking, 147.
 Barium Salts, Sulphates, and Chromates, Volumetric Estimation of: P. Soltsien, 149.

- Barium, Separation of, from Calcium: R. Fresenius, 149.
- Barral, M., and R. Lépine: Destruction of Sugar in the Blood by a Ferment, 111.
- Bases, Organic, A New Class of: C. Stoehr, 63.
- Baudin, E.: Detection of Resin Oil in Oil of Turpentine, 140.
- Baur, A.: Artificial Musk, 70.
- Béchamp, A.: Preparation of Soluble Casein, 109.
- Beckurts, H.: Ferrocyanides of the Alkaloids, 33.
- Beckurts, H.: Strychnine and Brucine, 42.
- Beef and Fish, Influence of Cooking on the Digestion of: M. Popoff, 113.
- Beef Tea: M. Spanton, 277.
- Beeswax, Detection of Paraffin in: H. Hager, 137.
- Beeswax, The Bleaching of: A. Buisine and P. Buisine, 294.
- Beeswax, The Composition of: A. Buisine and P. Buisine, 87.
- Beeswax, The Purity of: H. Röttger, 230.
- Béhal, M., and M. Choay: Chloralimide and its Isomeride, 84.
- Beirsdorff, M., and H. Unna: The Uses of Keratin, 273.
- Bell and Hills Fund, 503.
- Belladonna Alkaloids: O. Hesse, 34.
- Belladonna, Extract of: W. B. Cowie, 258.
- Bemmelen, J. M. van: Mineral Constituents of Tobacco Leaves, 175.
- Benzin Jelly, 292.
- Benzoin, Palembang: E. M. Holmes, 213.
- Benzosol, 76.
- Benzoylhomoeconine, 239.
- Berberine, 63.
- Berberine: R. Gaze, 56.
- Bergamot, Oil of, 217.
- Beringer, G. M.: Essence of Pepsin, 276.
- Beringer, G. M.: Solution of Malate of Iron, 272.
- Berlioz, M.: Microcidine, 73.
- Berthelot, M.: A Reaction of Carbonic Oxide, 20.
- Berthelot, M.: Reduction of Alkaline Sulphates by Carbon, 21.
- Bertram, J., and E. Gildemeister: Kesso Oil, 214.
- Bettendorf's Reagent for Arsenic: H. Warnecke, 153.
- Betulini Oleum, 223.
- Bevan, E. J., and C. F. Cross: Action of Nitric Acid on the Ligno-Celluloses, 91.
- Bevan, E. J., and C. F. Cross: An Acid Solvent of Cellulose, 91.
- Bile Constituents, Detection of, in Urine: A. Jolles, 119.
- Bile Pigments, Detection of, in Urine: S. Kathrein, 119.
- Birchwood Creosote (Oleum Betulini Rectificatum): M. Pfrenger, 223.
- Birkenwald, P.: Potassium Myronate, 86.
- Birzand Jaoshir, 421.
- Bismuth Potassium Iodides: C. Astre, 26.
- Bismuth Salicylate: H. Causse, 26.
- Bismuthi et Ammoniae Citratis Liquor: D. Gorrie, 260.
- Bismuthi Liquor, B.P.: P. Boa, 260.
- Blake, E.: Treatment of Persistent Dandruff, 280.
- Blau, F.: Constitution of Nicotine, 47.
- Blaud's Pills, 271.
- Bloch, O. F. C., W. R. Dunstan and M. Charteris: The Constituents of the Artificial Salicylic Acid of Commerce, and their Physiological Action, 28.
- Blood, Chemical Theory of the Coagulation of: M. Arthus and C. Pagès, 107.
- Blood, Destruction of Sugar in, by a Ferment: R. Lépine and M. Barral, 111.
- Blood, Detection of Carbonic Oxide in: A. Wetzell, 111.
- Blood, Detection of Carbonic Oxide in: M. Rubner, 111.
- Blum, L.: Volumetric Estimation of Zinc, 152.
- Boa, P.: Assay of Scammony, 212.
- Boa, P.: Liquor Bismuthi, B.P., 260.
- Bocchiola, M.: Constituents of Calumba Root, 162.
- Bond, C. J.: Perchloride of Mercury Pellets, 268.
- Boric Acid, Occurrence of, in the Vegetable Kingdom: E. Hotter, 107.
- Bornträger, H.: Detection of Resorcin and Thymol, 130.
- Bosetti, Dr.: Japanese Cantharides, 231.
- Bossung, E., and A. Edinger: Isoquinoline, 55.
- Böttger, C.: A New Reaction of Tannin, 131.

- Böttinger, C.: Gallic Acid, Tannin and Oak-Tannin, 68.
 Böttinger, C.: Oxidation Products of Tannic and Gallic Acids and Oak-Tannins, 70.
 Böttinger, C.: Tannin Extracts, 69.
 Bouquet, A Superior, 291.
 Bzidan, 159.
 Brandyle, K.: *Rhamnus Californica*, 172.
Brassica Nigra, 86.
 Brazilin: C. Schall and C. Dralle, 68.
 Bread, Estimation of Alumina in: W. C. Young, 135.
 Bretet, H.: Estimation of Free and Combined Carbonic Acid in Mineral Waters, 144.
 British Pharmaceutical Conference, Constitution and Rules of, 319.
 British Pharmaceutical Conference, Election of Officers for 1891-92, 506.
 British Pharmaceutical Conference, Financial Statement, 366.
 British Pharmaceutical Conference, List of Papers read at the Cardiff Meeting, 358, 359.
 British Pharmaceutical Conference, Meeting at Cardiff, 360.
 British Pharmaceutical Conference, Officers of, for 1890-91, 357.
 British Pharmaceutical Conference, Place of Meeting for 1892, 505.
Bromacetanilid, 75.
 Bromides, Chlorides, and Iodides, Qualitative Analysis of a Mixture of: F. A. Gooch and F. T. Brooks, 147.
 Bromides, Iodides, and Chlorides, Detection of: G. Denigès, 145.
 Bromine, Direct Estimation of, in Mixtures of Alkaline Bromides and Iodides: F. A. Gooch and J. R. Ensign, 147.
 Bromo-Derivatives of Quinoline: A. Claus and A. Welter, 55.
 Brooks, F. T., and F. A. Gooch: Qualitative Analysis of a Mixture of Iodides, Bromides, and Chlorides, 147.
 Brosi, G., and T. Gigli: *Lycopersicum Esculentum*, 194.
 Browning, P. E., and F. A. Gooch: Estimation of Iodides, 145.
 Brucine and Strychnine: H. Beckurts, 42.
 Brucine Ferrocyanide, 84.
 Brullé, R.: Detection of Adulteration in Olive Oil, 228.
Bryonia Dioica, Constituents of the Root of: A. Mankowsky, 163.
 Bryonidin, 163.
 Bryonin, 163.
 Buchka, K., and A. Magalhaes: Cytisine, 41.
 Buisine, A., and P.: The Bleaching of Beeswax, 294.
 Buisine, A., and P.: The Composition of Beeswax, 87.
 Bukowski, A.: Constituents of *Lycopodium* Oil, 223.
 Burrawang, 206.
 Burroughs, S. M.: Castor Oil with Extract of Malt, 484.
 Butyric and Acetic Acids, Estimation of Formic Acid in the Presence of: A. Scala, 123.
 Butter Fat, A new Constituent of. *Aldepalmitic Acid*: J. A. Wanklyn, 88.
 Butter, Rancid, Amount of Volatile Fatty Acids in: P. Corbetta, 85.
 Butyric Ferment, Fermentation of Starch by the: A. Villiers, 101.
 C.
Cachous, 281.
 Cadaverin and the Treatment of Cholera: R. Kobert, 219.
 Cadéac, M., and M. Albin: Poisonous Properties of the Oil of Sage (*Salvia Officialis*), 219.
Casalpinia Brevifolia, 68.
 Caffeidine: E. Schmidt and M. Wernicke, 40.
 Caffeine, Estimation of, in Tea: B. H. Paul, 133.
 Caffeine Salts: H. W. Suow, 40.
 Calcium and Strontium, Physiological Action of the Soluble Salts of: J. V. Laborde, 252.
 Calcium, Separation of Barium from: R. Fresenius, 149.
 Californian Soap Plant, *Chlorogalum Pomeridianum*, Constituents of: H. Trimble, 164.
 Calomel and Iodoform, Influence of Light on a Powder containing: G. Roe, 267.
 Calumba Root, Constituents of: M. Bocchiola, 162.
 Cambier, J., and T. J. Power: Loco Weeds, 180.
 Camerer, W.: Estimation of Uric Acid in Human Urine, 118.
 Camphor: F. Foerster, 85.

- Camphor, Combination of, with Phenols: E. Léger, 84.
- Camphor, Estimation of: F. Foerster, 85.
- Camphor, Florida: J. M. Maisch, 223.
- Cannabis Indica in Indigestion: G. Sée, 175.
- Cantharides, Japanese: Dr. Bosetti, 231.
- Caoutchouc Solutions: W. Lascelles, 292.
- Carbamide, Preparation of: J. Vollhard, 28.
- Carbazol, 75.
- Carbohydrate, A New, from Cereals: C. Tanret, 92.
- Carbohydrates, Colloid: J. Poehl, 91.
- Carbohydrates in Peach Gum: W. E. Stone, 92.
- Carbolic Acid, Cause of the Red Coloration of: E. Fabini, 83.
- Carbon, Reduction of Alkaline Sulphates by: M. Berthelot, 21.
- Carbonate of Sodium, Action of High Temperatures on: R. Kissling, 20.
- Carbonic Acid, Free and Combined, Estimation of, in Mineral Waters: H. Bretet, 141.
- Carbonic Oxide, A Reaction of: M. Berthelot, 20.
- Carbonic Oxide, Detection of, in Blood: A. Wetzel, 111.
- Carbonic Oxide, Detection of, in Blood: M. Rubner, 111.
- Carbothialdine and Thialdine, Physiological Action of: Prof. Lusini, 246.
- Cardiff, The Water Supply of: T. Hughes, 422.
- Carica Papaya, 182.
- Carica Papaya, A New Constituent of: M. Greshoff, 171.
- Carmine, Adulterated, 295.
- Carpaïne, 174, 182.
- Carrière, C. de la: Galega Officinalis as a Galactagogue, 178.
- Cascara Sagrada and Extracts: J. Moss, 476.
- Cascara Sagrada, Report on the Action of some Liquid and Solid Preparations of: J. Jardine, 482.
- Casein, 108.
- Casein, Soluble, Preparations of: A. Béchamp, 109.
- Caseinogen, 108.
- Cassia, Oil of: E. Hirschsohn, 220.
- Cassia, Oil of, Tests for Purity: E. Hirschsohn, 220.
- Cassytha Filiformis, 48.
- Castor Oil: H. Meyer, 224.
- Castor Oil, The Purity of: J. A. Wilson, 224.
- Castor Oil with Extract of Malt: S. M. Burroughs, 484.
- Cataputiae Minoris, Constituents of the Seeds of: Y. Tahara, 195.
- Cause, H.: Bismuth Salicylate, 26.
- Cavaillès, M.: Aristol Plasters, 282.
- Cazeuue, P.: A Violet Colouring Matter derived from Morphine, 70.
- Cedar Nuts, Siberian: E. Lehmann, 193.
- Cellulose, An Acid Solvent of: C. F. Cross and E. J. Bevan, 91.
- Cement, 293.
- Ceratopetalum Apetalum, 208, 209, 210.
- Ceratopetalum Gummiferum, 208, 209, 210.
- Ceratopetalum, Observations on the Gums yielded by two Species of: J. H. Maiden, 208.
- Ceratum Salicylatum: M. Scheerer, 283.
- Cerbera Odollam, 186.
- Cereals, Copper in: W. Johnstone, 153.
- Cerotic Acid: T. Marie, 81.
- Cetrarin, the Bitter Principle of Iceland Moss, Physiological Effects of: R. Kobert, 249.
- Chacs Sanguinea, 167.
- Chapped Hands, Embrocation for: P. Vigier, 281.
- Charalampi, M.: Delphinium Staphisagria, 195.
- Charteris, M., Cresotic and Salicylic Acids, 31.
- Charteris, M., W. R. Dunstan and O. F. C. Block: The Constituents of the Artificial Salicylic Acid of Commerce and their Physiological Action, 28.
- Chatin, A.: Parasitical Plants, 190.
- Chatinine, 161.
- Chaulmoogra Oil, Note on: J. Moss, 224.
- Chelerythrine, 168.
- Chelidonic Acid, Synthesis of: L. Claisen, 79.
- Chelidonium Majus, 168.
- Chelidonium Majus, Constituents of: F. Selle, 175.

- Cherry-Laurel Water and Morphine Salts: T. Salzer, 264.
- Chilblains, Preparations for, 280.
- Chinese Cinnamon: H. Humphreys, 170.
- Ching Fa Kwei (see article on Chinese Cinnamon), 170.
- Chloral-Phenol: E. Fabini, 84.
- Chloralimide and its Isomeride: MM. Béhal and Choay, 84.
- Chloralamide, Sulphonal and Paraldehyde, 236.
- Chloride of Silver, The Decomposition of, by Light: A. Richardson, 23.
- Chlorides, Bromides, and Iodides, Detection of: G. Denigès, 145.
- Chlorides, Iodides, and Bromides, Qualitative Analysis of a Mixture of: F. A. Gooch, and F. T. Brooks, 147.
- Chlorine, Direct Estimation of, in Mixtures of Alkaline Chlorides and Iodides: F. A. Gooch and F. W. Mar, 146.
- Chlorine, Importance of, in the Plant: A. Aschoff, 106.
- Chlorine, Preparation of, for Technical Purposes: A. Reychler and de Wilde, 20.
- Chlorine, Volumetric Estimation of, in Urine: A. Corvi, 117.
- Chloroform, Purification of, by Cold: M. Pictet, 27.
- Chlorogalum Pomeridianum (Californian Soap Plant), Constituents of: H. Trimble, 164.
- Choay, M., and M. Béhal: Chloralimide and its Isomeride, 84.
- Cholera, Cadaverine and the Treatment of: R. Kobert, 249.
- Cholesterin Fats in Man: O. Liebreich, 111.
- Cholesterin, Reaction of: K. Obermüller, 90.
- Cholesterin, The Chemical Formula of: K. Obermüller, 90.
- Chonemorpha Macrophylla, 186.
- Chromates, Barium Salts, and Sulphates, Volumetric Estimation of: P. Soltsien, 149.
- Chromates, New Double: A. Lachaud and C. Lepierre, 24.
- Chrysanthemine, 176.
- Chrysanthemum Cinerariæfolium: F. Marino Zucco, 176.
- Chrysarobin, Ointment and Suppositories of: M. Kosobudski, 285.
- Chrysophyllum Glyciphloeum, 167.
- Ciancieian, G., and P. Silber: Hydrocotoin, a Constituent of Coto-Bark, 55.
- Cinchona Bark. Assay of: W. Haubensack, 171.
- Cinchona Extractum Liquidum: M. C. Traub, 259.
- Cinchonidine Ferrocyanide, 33.
- Cinchonidine, Quinine and their Isomers, Observations on: O. Hess, 47.
- Cinchonidine Salicylate, Therapeutic Properties of: Dr. McCall, 245.
- Cinchonine Ferrocyanide, 33.
- Cinchonine Iodo-Sulphate, or Anti-septol: P. Yvon, 276.
- Cinnamene and Indene in Coal-Tar: G. Kraemer and A. Spilker, 83.
- Cinnamic Acid and its Homologues, Preparation of: L. Claisen, 81.
- Cinnamon, Chinese: H. Humphreys, 170.
- Ciotto, F., and P. Spica: Detection of Atropine in Forensic Investigations, 124.
- Citric Acid, Synthesis of: A. Haller and A. Held, 82.
- Citronella, Commercial Oil of: J. C. Umney, 215.
- Claisen, L.: Preparation of Cinnamic Acid and its Homologues, 81.
- Claisen, L.: Synthesis of Chelidonic Acid, 79.
- Claisen, L., and E. Hori: Synthesis of Aconitic Acid, 78.
- Clark, H. W., and A. Hazen: Effect of Temperature on Nessler's Test, 142.
- Clarke, J. M.: Administration of Hydronaphthol, 234.
- Claus, A., and A. Welter: Bromo-Derivatives of Quinoline, 55.
- Cleveland, H. E.: Yerba Santa, 180.
- Cliffe, W. L.: Cold Cream from Cotton-Seed Oil, 285.
- Clotting, Influence of Salts on: S. Ringer and H. Sainsbury, 107.
- Coagulation of Blood, Chemical Theory of the: M. Arthus and C. Pagès, 107.
- Coal-Tar, Indene and Cinnamene in: G. Kraemer and A. Spilker, 83.
- Coca, Erythroxyton, Note on the Fruit of: C. J. H. Warden, 191.
- Coca Poisoning, Detection of, in Forensic Investigations: U. Mussi, 126.
- Cocaine, A New Reaction of: F. da Silva, 127.

- Cocaine and Atropine, The Relation between: A. Einhorn, 88.
- Cocaine and Ecgonine, Reactions of: D. Vitali, 127.
- Cocaine Ferrocyanide, 33.
- Cocaine Group, The Pharmacology of the: E. Poulsso, 239.
- Cocaine Group, The Pharmacology of the: P. Ehrlich, 238.
- Cocaine Hydrochlorate, A New Reaction of: E. Schell, 127.
- Cocaine, Physiological Action of: U. Mosso, 239.
- Cocaine Salts: W. Müller, 39.
- Cocoa-Butter: F. Filsinger, 226.
- Cod-Liver Oil: H. Unger, 229.
- Cod-Liver Oil, Ferrated, 272.
- Cohen, J. B., and J. Grant: Estimation of Alkalies in Presence of Sulphites, 141.
- Cohen, J. B., and R. W. Oddy: Comparison of the Methods in Use for Estimating Organic Nitrogen, 144.
- Colchicine, Detection of, in Forensic Investigations: N. Obolonski, 124.
- Colchicum Seeds, Assay of: A. Kremel, 196.
- Cold Cream from Cotton-Seed Oil: W. L. Cliffe, 285.
- Colloidion, Mercurial, as a Remedy for Warts: M. Kaposi, 279.
- Colloid Carbohydrates: F. Poehl, 91.
- Colorado Cough Root, 188.
- Colorado Mountain Sage, 177.
- Combemale, P.: Therapeutic Action of Agaric Acid, 249.
- Combemale, P.: Therapeutic Properties of Sodium Tellurate, 251.
- Combemale, P., and M. Dubiquet: Physiological Action of Potassium Ferrocyanide, 251.
- Combretum, 197.
- Coniine, Detection of, in a Case of Poisoning: L. W. Andrews, 125.
- Coniine Ferrocyanide, 33.
- Coninck, O. de: Ptomaines, 64.
- Conium Maculatum, A New Alkaloid from: E. Merck and A. Ladenburg, 46.
- Conroy, M.: A Note on Extractum Euonymi Siccum, 401.
- Conroy, M.: Mistura Olei Ricini, 260.
- Conroy, M.: Note on a Proposed Method of Standardizing the Extracts of Nux Vomica and Opium, 447.
- Copaiba, Notes on the Estimation of Volatile Oil in: R. A. Cripps, 414.
- Copellidine, 245.
- Copper in Cereals: W. Johnstone, 153.
- Copper Potassium Carbonate Solution, Estimation of Sugar by Means of: H. Ost, 121.
- Corbetta, P.: Amount of Volatile Fatty Acids in Rancid Butter, 88.
- Corn Cockle Seeds, Toxicity of: V. Lehmann and M. Mori, 192.
- Corns, Remedies for: H. M. Whelpley, 279.
- Corvi, A.: Volumetric Estimation of Chlorine in Urine, 117.
- Corydaline, 62.
- Corydalis Cava, The Alkaloids of: F. Adernann, 62.
- Cotarnine, 244.
- Coto-Bark, Hydrocotoin a Constituent of: G. Ciamician and P. Silber, 55.
- Cotton-Seed Oil, Cold Cream from: W. L. Cliffe, 285.
- Coward, F. A.: Mercuric Chloride in Diphtheria, 250.
- Cowie, W. B.: Extract of Belladonna, 258.
- Cownley, A. J., and B. H. Paul: Amount of Theine in Tea, 134.
- Cradina (*see* article on The Digestive Ferment in Fig Sap), 106.
- Cresote, Birchwood (Oleum Betulinii Rectification): M. Pfrenger, 223.
- Cresotic and Salicylic Acids: M. Charteris, 31.
- Cripps, R. A.: Note on Solution of Albumen, B. P., 268.
- Cripps, R. A.: Notes on the Estimation of Volatile Oil in Copaiba, 414.
- Cripps, R. A.: Oil of Rosemary, 216.
- Cripps, R. A., and A. Whitby: Report upon Ipecacuanha, 385.
- Crismer, L.: Test for Aldehyde, 129.
- Cross, C. F., and E. J. Bevan: Action of Nitric Acid on the Ligno-Celluloses, 91.
- Cross, C. F., and E. J. Bevan: An Acid Solvent of Cellulose, 91.
- Crotalaria Retusa, 184.
- Crotalaria Sagittalis, 180.
- Crotalaria Striata, 184.
- Croton Oil: A. Reuter, 224.
- Cryptocarya Australis, 42.
- Cubebs: E. M. Holmes, 193.
- Cupreine, Metallic Derivatives of: A. C. Oudemans, 52.

- Cupreine, Transformation of, into Quinine: E. Grimaux and A. Arnaud, 51.
- Curacao Aloes: E. M. Holmes, 202.
- Curare, Physiological Action of: J. Tillie, 197.
- Curare, Physiological Action of: W. Nikolski and J. Dogiel, 198.
- Curarine, 246.
- Curarine Sulphate, 198.
- Curtius, T.: Hydrogen Nitride (Azoimide), 19.
- Curtius, T., and R. Radenhausen: Hydrogen Nitride (Azoimide), 20.
- Cymene, The Constitution of: O. Widman, 86.
- Cynanchum Ipecacuanha, 165.
- Cynanchum Vomitorium, 165.
- Cyrtosperma, 186.
- Cystin, Formation of, in Pancreatic Digestion: E. Külz, 114.
- Cystin in Urine: S. Delépine, 114.
- Cytisine: A. Partheil, 40.
- Cytisine: K. Buchka and A. Magalhaes, 41.
- Cytisine and Ulexine, Identity of: A. Partheil, 42.
- Cytisus, 184.
- D.
- Danckwortt, W.: Derivatives of Morphine, 46.
- Dandruff, Salicylic Acid Lotion for: E. Dieterich, 280.
- Dandruff, Treatment of Persistent: E. Blake, 280.
- Daphnandra Repandula, 42.
- Daphnidium Cubeba, 42.
- Datura Stramonium, 81.
- Daturic Acid: E. Gérard, 81.
- David, P.: Dentists' Moulding Wax, 282.
- Davies, D. Hughes: Pill Coating, 261.
- Davies, R. H., and T. H. Pearmain: Some Notes on Oil of Eucalyptus and Eucalyptol, 465.
- Davis, F.: *Acarus Lini*, 231.
- Davis, F.: Report upon Medicated Lozenges, B.P., 490.
- Deir, A.: Hungarian Opium, 190.
- Deiss, N. E., and C.: Estimation of Anhydrous Glycerine in Commercial Glycerine, 139.
- Delegates, Reception of, 363.
- Delépine, S.: Cystin in Urine, 114.
- Delphinium Staphisagria: M. Charalampi, 195.
- Delphisine, 196.
- Demandre, M.: Preparation of Hypnal, 274.
- Denigès, G.: Detection of Chlorides, Bromides, and Iodides, 145.
- Dentists' Moulding Wax: P. David, 282.
- Dermatological Remedies, Modern, 286.
- Derrid, 183.
- Derris (Pongamia) Elliptica, 183.
- Desesquelle, E.: Elimination of Naphthol with the Urine, 117.
- Dextrin and Starch: C. Scheibler and H. Mittelmeier, 94.
- Dextrinase, 93.
- Dextro-Cocaine, 239.
- Dextrolimonene, 221.
- Dextrose, 122.
- Dey, A. J.: Tincture of Nux Vomica, 254.
- Diastase, The Chemical Nature of: H. P. Wijsman, 93.
- Dickinson, W. L., and J. N. Langley: Physiological Action of Pituri and Nicotine, 245.
- Dietel, M.: Elixir of Liquorice, 268.
- Dieterich, E.: Assay of Opium, 199.
- Dieterich, E.: Detection of Adulteration in Lard, 136.
- Dieterich, E.: Ink for Rubber Stamps, 294.
- Dieterich, E.: Salicylic Acid Lotion for Dandruff, 280.
- Dieterich, E.: Salicylic Acid Shampoo, 283.
- Dieterich, E.: Syrup of Raspberries, 276.
- Dieterich, E.: Window Polishing Paste, 293.
- Diethylenediamine, 74.
- Diethylenediamine, Identity of Piperazidine with: A. W. v. Hofmann, 72.
- Digestion, Effect of Salt on: A. Stutzer, 112.
- Digestion of Albuminoids, Effect of Saccharin on: A. Stutzer, 113.
- Digestion, Pancreatic, Formation of Cystin in: E. Külz, 114.
- Digestive Ferment in Fig Sap: U. Mussi, 106.
- Digitalis, Infusion, Gelatinization of: Dr. Forcke, 257.
- Digitalis, Infusion of: F. Lascar, 257.
- Digitic Acid, 66.
- Digitogenic Acid, 66.

- Digitonin and Digitogenin: H. Kiliani, 64, 65.
 Dipentene, 221.
 Diphenylene Oxide, 75.
 Diphtheria, Mercuric Chloride in: F. A. Coward, 250.
 Ditte, A.: Action of Metals on Sulphuric Acid, 25.
 Diuretin: Dr. Eckenroth, 32.
 Diuretin: L. Lambert, 32.
 Diuretin: M. Marette, 31.
 Diuretin, Assay of: G. Vulpius, 32.
 Dogiel, J., and W. Nikolski: Physiological Action of Curare, 198.
 Donath, E., and G. Hattensaur: Volumetric Estimation of Zinc, 151.
 Donath, J.: Therapeutic Properties of Ethylene Bromide, 250.
 Donner, A.: Orexin, 76.
 Dott, D. B., and R. Stockman: Physiological Action of Morphine and its Derivatives, 242.
 Dott, D. B., and R. Stockman: Physiological Action of Thebaine, Narcotine, and their Derivatives, 244.
 Dragon's Blood: E. M. Holmes, 212.
 Dralle, C., and C. Schall: Brazilin, 68.
 Drimys Aromatica and D. Dipetala: J. H. Maiden, 172.
 Dubiquet, M., and P. Combemale: Physiological Action of Potassium Ferrocyanide, 251.
 Dubourg, E., and U. Gayon: Alcoholic Fermentation of Invert Sugar, 105.
 Duncan, W.: Protection of Solution of Litmus from Change, 141.
 Dunning, J., and F. F. Riches: Saffron, its Adulterations and their Mode of Detection, 177.
 Dunstan, W. R., and W. H. Ince: Crystalline Alkaloid of Aconitum Napellus, 43.
 Dunstan, W. R., O. F. C. Bloch, and M. Charteris: The Constituents of the Artificial Salicylic Acid of Commerce, and their Physiological Action, 28.
 Dunwoody, R. G.: Oil of Turpentine, 86.
 Dyer, E. E.: Toxic Effects of Exalgin, 238.
 Dyes, The Chemistry of Organic: F. W. Passmore, 71.
 Ear-wax, Solution for Softening, 289.
 Easton's Elixir: F. Edel, 270.
 Ecgonine: C. Liebermann, 39.
 Ecgonine and Cocaine, Reactions of: D. Vitali, 127.
 Eckenroth, Dr.: Diuretin, 32.
 Edel, F.: Easton's Elixir, 270.
 Edinger, A., and E. Bossung: Isoquinoline, 55.
 Egg Albumen, Action of Glycerine on: V. Grandis, 110.
 Egg Albumen free from Ash: E. Harnack, 109.
 Ehrlich, P.: The Pharmacology of the Cocaine Group, 238.
 Ehrmann, A. H.: Trichloroacetic Acid as a Caustic, 278.
 Einhorn, A.: The Relation between Cocaine and Atropine, 38.
 Einhorn, A.: Tropidine, 36.
 Elder Bark as a Diuretic: G. Lemoine, 168.
 Elixir, Easton's: F. Edel, 270.
 Elixir of Liquorice: M. Dietel, 268.
 Ellagic and Ellagenic Acids, 68.
 Ellwood, T. A.: Lemon Juice, 263.
 Encephalartos Denisonii, 205.
 Encephalartos Spiralis, 205.
 Ensign, J. R., and F. A. Gooch: Direct Estimation of Bromine in Mixtures of Alkaline Bromides and Iodides, 147.
 Ephedra Monostachya: P. Spehr, 167.
 Ephedra Vulgaris, 167.
 Epicauta Gorhami, 231.
 Ergot and its Preparations: R. Kobert, 190.
 Eriodictyon Glutinosum, 180.
 Erythrina (Hypaphorus) Subumbra, 184.
 Erythrina (Stenotropis) Broteroï, 183.
 Erythrophloeum Guineense, 197.
 Erythroxyton Coca, Note on the Fruit of: C. J. H. Warden, 191.
 Essential Oils and Terpenes: O. Wallach, 86.
 Ethoxy-Antifebrin, 75.
 Ethyl-Ether, Commercial Detection of Alcohol in: T. Poleck and K. Thümmel, 130.
 Ethylene Bromide, Therapeutic Properties of: J. Donath, 250.
 Eucalyptus Amygdalina, 222, 468.
 Eucalyptus Citriodora, 474.

- Eucalyptus Corymbosa*, 468.
Eucalyptus Dealbata, 473.
Eucalyptus Dumosa, 469.
Eucalyptus Globulus, 222, 468.
Eucalyptus Gunnii, Constituents of Manna from: F. W. Passmore, 201.
Eucalyptus Honey: F. W. Passmore, 230.
Eucalyptus Honey, The so-called, of Commerce: T. P. Anderson Stuart, 230.
Eucalyptus Oil: P. W. Squire, 222.
Eucalyptus, Oil of, and *Eucalyptol*. Some notes on: R. H. Davies and T. H. Pearmain, 465.
Eucalyptus Oleosa, 468.
Eugenia Jambolana, 168.
Euonymi Extractum Siccum, A Note on: M. Conroy, 401.
Euonymus Atropurpureus, 401.
Euonymus Japonicus, 190.
Euphorin, 274.
Exalgin, 75.
Exalgin, Antifebrin and Phenacetin in Neuralgia: T. P. Thomson, 274.
Exalgin, Toxic Effects of: E. E. Dyer, 238.
 Excursion, The (British Pharmaceutical Conference), 510.
 Executive Committee, Meeting of, 361.
 Executive Committee, Report of, 364.
 Extract of Belladonna: W. B. Cowie, 258.
 Extract of Malt with Castor Oil: S. M. Burroughs, 484.
 Extracts of *Cascara Sagrada*: J. Moss, 476.
 Extracts of *Nux Vomica* and *Opium*. Note on a proposed Method of Standardizing: M. Conroy, 447.
 Extracts, Tannin: C. Böttinger, 69.
Extractum Cinchonæ Liquidum: M. C. Traub, 259.
Extractum Eriodictyi Fluidum, 180.
Extractum Euonymi Siccum, A Note on: M. Conroy, 401.
Extractum Jalapæ Alcoholicum: J. E. Wishart, 258.
- F.
- Fabini, E.: Cause of the Red Coloration of Carbolio Acid, 83.
 Fabini, E.: Chloral-Phenol, 84.
 Fairley, T.: Detection of Traces of Hydrogen Peroxide, 140.
 Farlow, J. W.; Resorcin Spray in Whooping-cough, 276.
 Farr, E. H., and R. Wright: The Solvent Action of Alcohol of Different Degrees of Strength on some of the Drugs used in making Pharmacopœial Tinctures, 253, 495.
 Fats, Cause of the Rancidity of: E. Ritsert, 88.
 Fats (Solid), Waxes and Resins, Simple Method for Determining the Specific Gravity: A. Gawalski, 228.
 Fats, Waxes, etc., A New Method for the Saponification of: A. Kossel and K. Obermüller, 89.
 Fatty Acids, Determination of, in Soap: M. Saupe, 139.
 Fenchol, 215.
 Fennel, Oil of: O. Wallach and F. Hartmann, 215.
 Ferment, The Digestive, in Fig Sap: U. Mussi, 106.
 Fermentation, Acetic, Action of Light on: M. Giunti, 105.
 Fermentation of Invert Sugar, Alcoholic: U. Gayon and E. Dubourg, 105.
 Fermentation of Starch by the Butyric Ferment: A. Villiers, 104.
 Fermentation of Uric Acid, Ammoniacal: F. and L. Sestini, 115.
 Ferrated Cod-Liver Oil, 272.
Ferri Formatis Tinctura: M. Rozsnyai, 271.
Ferri Protochloridi Pilula: J. B. McLaren, 272.
Ferri Vinum, B.P.: J. A. Forret, 257.
Ferrie Hypophosphite, Assay of: F. X. Moerk, 150.
 Ferrocyanide of Potassium, Physiological Action of: P. Combemale and M. Dubiquet, 251.
 Ferrocyanide Test for Albumen in Urine: A. Jolles, 119.
 Ferrocyanides of the Alkaloids: H. Beckurts, 33.
Ferula Erubescens, 420.
Ferula Galbaniflua, 417.
Ferula Gummosa, 420.
Ferula Rubricaulis, 417, 420.
Ferula Schair, 420.
 Fig Sap, The Digestive Ferment in: U. Mussi, 106.
 Filsinger, F.: Cocoa-Butter, 226.
 Findlay, J.: Pill Excipients, 261.

- Fischer, E.: Reduction of Fruit Sugar, 104.
 Fischer, E.: Syntheses in the Sugar Group, 95.
 Fischer, E.: Synthetical Formation of a New Sugar from Glucose, 104.
 Fischer, E., and F. W. Passmore: New Synthetic Sugars, 103.
 Fischer, E., and O. Piloty: Synthesis of Glycuronic Acid, 80.
 Fish and Beef, Influence of Cooking on the Digestion of: M. Popoff, 113.
 Fittig, R., and P. Röders: Phenylitaconic Acid, 82.
 Flindersia Maculosa, The Gum of: J. H. Maiden, 210.
 Florida Camphor: J. M. Maisch, 223.
 Fock, A., and K. Klüss: Hyposulphites, 23.
 Foerster, F.: Camphor, 85.
 Foerster, F.: Estimation of Camphor, 85.
 Foerster, O.: Assay of Sodium Nitrate, 142.
 Foo Kwei (see article on Chinese Cinnamon), 170.
 Forcke, Dr.: Gelatinization of Infusion of Digitalis, 257.
 Formanilid, 77.
 Formic Acid, Estimation of, in the Presence of Acetic and Butyric Acids: A. Scala, 123.
 Formulary Committee, Election of, 504.
 Formulary Committee, Report of, 884.
 Forret, J. A.: Iron Wine, Vinum Ferri, B. P., 257.
 Forti, C.: Constituents of Melon Seeds, 194.
 Fox, G. H.: The Dermatological Value of Sulpholeate of Sodium, 252.
 Fresenius, R.: Quantitative Separation of Barium and Strontium, 148.
 Fresenius, R.: Separation of Barium from Calcium, 149.
 Freund, M., and M. Heim: Hydrastine, 55.
 Fritsch, H.: Tinctura Hæmostyptica, 272.
 Fruit-Sugar, Reduction of: E. Fischer, 104.
 Fumarine, 63.
 Furfuran, 75.
 Furniture Polish, 293.
 Furniture Varnish, Russian, 293.
 Fusel Oil, American: J. H. Long and C. E. Linebarger, 28.
- G.
- Galactose, 122.
 Galbanum, Liquid Persian: E. M. Holmes, 417.
 Galega Officinalis as a Galactagogue: C. de la Carrière, 178.
 Gallic Acid, Tannin, and Oak-Tannin: C. Bötttinger, 68.
 Gallic and Tannic Acids and Oak Tannins, Oxidation Products of: C. Bötttinger, 70.
 Gallisin: C. Scheibler and H. Mittelemeier, 105.
 Galls, some American, collected in the neighbourhood of Philadelphia: H. Trimble, 188.
 Gawalowski, A.: Simple Method for Determining the Specific Gravity of Waxes, Resins, and Solid Fats, 228.
 Gayon, U., and E. Dubourg: Alcoholic Fermentation of Invert Sugar, 105.
 Gaze, R.: Berberine, 56.
 Geraniol, 219.
 Geranium, Indian, Oil of: F. W. Semmler, 219.
 Geranium Maculatum, The Astringent Principle of: H. Trimble and J. C. Peacock, 165.
 Geranium Red, 165.
 Gérard, E.: Daturic Acid, 81.
 Gerrard, A. W.: The Alkaloidal Value of some Commercial Henbanes, 428.
 Gerrard, A. W.: The Mercuric Test for Mydriatic Alkaloids, 128.
 Gigli, T., and G. Brosi: Lycopersicum Esculentum, 194.
 Gildemeister, E., and J. Bertram: Kesso Oil, 214.
 Giunti, M.: Action of Light on Acetic Fermentation, 105.
 Globulin and Albumen in Urine: D. Noel Paton, 114.
 Glucose, Conversion of, into Sorbitol (Sorbite): J. Meunier, 103.
 Glucose, Synthetical Formation of a New Sugar from: E. Fischer, 104.
 Glutamine (see article on Constituents of Stachys Tuberifera), 164.
 Glutin-Peptide-Sublimate Hydrochloride: M. Paal, 269.

- Glycerine, Action of, on Egg Albumen: V. Grandis, 110.
- Glycerine, Anhydrous, Estimation of, in Commercial Glycerine: N. E. and C. Deiss, 139.
- Glycerine, Estimation of, in Soap: L. J. Spencer, 139.
- Glycerine, Purity of: B. Jaffé, 138.
- Glycerine, Purity of: H. Will, 138.
- Glycerine Soap, Fluid, 284.
- Glycerine Suppositories: M. Balland, 285.
- Glycerine, Test for: C. A. Kohn, 138.
- Glycerinum Saponatum: Prof. Hebra, 284.
- Glycuronic Acid, Compounds of: E. Külz, 81.
- Glycuronic Acid, Synthesis of: E. Fischer and O. Piloty, 80.
- Glycyrrhiza Glabra, 158.
- Glycyrrhiza Lepidota: M. L. McCullough, 158.
- Goldmann, F.: Antikamnia, 276.
- Gooch, F. A., and F. T. Brooks: Qualitative Analysis of a Mixture of Iodides, Bromides, and Chlorides, 147.
- Gooch, F. A., and F. W. Mar: Direct Estimation of Chlorine in Mixtures of Alkaline Chlorides and Iodides, 146.
- Gooch, F. A., and J. R. Ensign: Direct Estimation of Bromine in Mixtures of Alkaline Bromides and Iodides, 147.
- Gooch, F. A., and P. E. Browning: Estimation of Iodides, 145.
- Gorgeu, A.: Action of Hydrogen Peroxide on Oxygen Compounds of Manganese, 21.
- Gorrie, D.: Liquor Bismuthi et Ammoniae Citratis, 260.
- Grandis, V.: Action of Glycerine on Egg Albumen, 110.
- Grant, J., and J. B. Cohen: Estimation of Alkalies in Presence of Sulphites, 141.
- Grass-Tree Gum: J. H. Maiden, 210.
- Greenish, H. G.: Note on Phlox Carolina, 160.
- Greshoff, M.: A New Constituent of Carica Papaya, 174.
- Greshoff, M.: Chemical Notes on Plants growing in the Dutch Indies, 182.
- Greshoff, M.: Laurotetanine, 42.
- Grimaux, E., and A. Arnaud: Transformation of Cupreine into Quinine, 51.
- Gröger, M.: Potassium Iodate as a Standard for Iodometry, Acidimetry, and Alkalimetry, 140.
- Grosjean, L., and A. Jorissen, Solanidine from Potato Sprouts, 37.
- Guaiac Resin, Therapeutic Properties of: W. Murrell, 213.
- Guaiacol, Iodoformed: M. Picot, 276.
- Guaiacol, Physiological Action of: P. Marfori, 233.
- Gucci, P.: Santoninoxime and its Derivatives, 66.
- Gum of Macrozamia (Encephalartos): H. J. Maiden, 205.
- Gum of Peach, Carbohydrates in: W. E. Stone, 92.
- Gum of the Leopard Tree, Flindersia Maculosa: J. H. Maiden, 210.
- Gum-Resins, Resins, and Balsams: M. Bamberger, 212.
- Gums, Indian, for Pharmacy Work: Dr. S. Rideal and W. E. Youle, 405.
- Gums yielded by two Species of Ceratopetalum, Observations on: J. H. Maiden, 208.
- Gürber, A.: Physiological Action of Lupetidine and Allied Substances in Relation to their Chemical Constitution, 245.
- Gynnama Latifolium, 186.
- Gyrocarpus Asiaticus, 43.

II.

- Haas, A.: Styrcol as a Remedy for Phthisis, 233.
- Haasia Firma, 43.
- Haasia Squarrosa, 42.
- Hæmatin, a Vegetable (Aspergillin): G. Linossier, 107.
- Hæmatin, Vegetable: T. L. Phipson, 107.
- Hæmatoporphyrin, Occurrence of, in Urine: E. Salkowski, 116.
- Haenle, O.: Honey, 135.
- Haensel, M.: Oil of Stavesacre Seeds, 214.
- Hager, H.: Detection of Paraffin in Beeswax, 137.
- Haller, A., and A. Held: Synthesis of Citric Acid, 82.
- Halliburton, W. D.: The Proteids of Milk, 108.
- Haplopappus Baylahuen: H. H. Rusby, 179.
- Harnack, E.: Egg Albumen free from Ash, 109.

- Harrow, G.: A Rapid Method of Estimating Nitrates in Potable Waters, 143.
- Hartmann, F., and O. Wallach: Oil of Fennel, 215.
- Hattensaur, G., and E. Donath: Volumetric Estimation of Zinc, 151.
- Haubensak, W.: Assay of Cinchona Bark, 171.
- Haussmann, F. W.: Antikamnia, 275.
- Haussmann, U.: Estimation of Sugar in Urine, 120.
- Hazen, A., and H. W. Clark: Effect of Temperature on Nessler's Test, 142.
- Hebra, Prof.: Glycerinum Saponatum, 284.
- Hedeoma Piperita, 187.
- Hedeoma Pulegioides, 187.
- Hedeoma Thymoides, 187.
- Hefelmann, M.: Adulterated Mac, 193.
- Heim, M.: Hydrastine, 55.
- Heim, M., and M. Freund: Hydrastine, 55.
- Helbing, H.: Sodium Paracreatate, 30.
- Held, A., and A. Haller: Synthesis of Citric Acid, 82.
- Henbane Seed, Note on the Constituents of: F. Ransom, 434.
- Henbane, Tincture of, 495.
- Henbanes, The Alkaloidal Value of some Commercial: A. W. Gerrard, 428.
- Hepatic Cape Aloes, 203.
- Hernandia Ovigera, 43, 186.
- Hernandia Sonora, 43, 186.
- Hertel, F. G.: Hydrochlorate of Phenocoll, 233.
- Hesse, O.: Atropamine, 35.
- Hesse, O.: Belladonna Alkaloids, 34.
- Hesse, O.: Isocinchonine, 53.
- Hesse, O.: Observations on Quinine, Cinchonidine, and their Isomers, 47.
- Heuchera Americana: J. C. Peacock, 163.
- Heumann, K.: New Synthesis of Indigo, 71.
- Hexyllupetidine, 245.
- Hieracium Scouleri, 199.
- Hieracium Venosum, 199.
- Hinsdale, S. J.: Simple Method for the Detection of Petroleum in Oil of Turpentine, 140.
- Hippurylhydrazine, 19.
- Hirano, M., and M. Shimojama: Pierasma Eilantoides, 173.
- Hirschsohn, E.: Oil of Cassia, 220.
- Hirschsohn, E.: Oil of Peppermint, 219.
- Hirschsohn, E.: Tests for the Purity of Oil of Cassia, 220.
- Hodgkin, J.: Glacial Phosphoric Acid, 437.
- Hofmann, A. W. v.: Identity of Piperazidine with Diethylenediamine, 72.
- Holcaspis Globulus, 189.
- Holmes, E. M.: Cubebs, 193.
- Holmes, E. M.: Curaçoa Aloes, 202.
- Holmes, E. M.: Dragon's Blood, 212.
- Holmes, E. M.: Liquid Persian Galbanum, 417.
- Holmes, E. M.: Natal Aloes, 203.
- Holmes, E. M.: Palembang Benzoin, 213.
- Holmes, E. M.: The Opium used in Medicine, 486.
- Holmes, E. M., and Surgeon Parke: The Arrow Poison of the Pigmies, 196.
- Homarecoline, 62.
- Homochelidonine, 163, 175.
- Homococaine, 239.
- Honey: O. Haenle, 135.
- Hooper, D.: Presence of an Alkaloid in Tylophora Asthmatica, 165.
- Hooper, D.: Sweet Pellitory, 159.
- Hooper, D.: The Leaves of Strychnos Nux-Vomica, 173.
- Hori, E., and L. Claisen: Synthesis of Aconitic Acid, 78.
- Hotter, E.: Occurrence of Boric Acid in the Vegetable Kingdom, 107.
- Hughes, T.: A Short Description of the Present and Future Water Supply of Cardiff, 422.
- Humphrey, H.: Chinese Cinnamon, 170.
- Hungarian Opium: A. Deir, 199.
- Hunteria Corymbosa, 185.
- Huppert, H.: Estimation of Acetone in Urine, 120.
- Hydnocarpus, 187.
- Hydracetin, 76.
- Hydrargyri Nitratis Unguentum: J. Lothian, 263.
- Hydrastine: M. Freund and M. Heim, 55.
- Hydrastine: M. Heim, 55.
- Hydrastine Ferrocyanide, 33.
- Hydrates of Alcohol, The Supposed: S. U. Pickering, 27.

- Hydrazine, Physiological Action of: O. Loew, 238.
 Hydrazone, 76.
 Hydroberberine, 62.
 Hydrobromotropidine hydrobromide, 36.
 Hydrochlorate of Phenocoll: F. G. Hertel, 238.
 Hydrocotarnine, 244.
 Hydrocotoin, a Constituent of Coto-Bark: G. Ciamician and P. Silber, 55.
 Hydrocyanic Acid, The Distribution of, in the Vegetable Kingdom, 186.
 Hydrogen Nitride (Azoimide): T. Curtius, 19.
 Hydrogen Nitride (Azoimide): T. Curtius and R. Radenhausen, 20.
 Hydrogen Peroxide, Action of, on Oxygen Compounds of Manganese: A. Gorgen, 24.
 Hydrogen Peroxide, Detection of Traces of: T. Fairley, 140.
 Hydronaphthol, Administration of: J. M. Clarke, 234.
 Hydroxy-Antifebrin, 75.
 Hygrine: C. Liebermann and O. Kühling, 39.
 Hyosine Hydrochloride, Physiological Action of: M. Pavloff, 244.
 Hyoscyamus Niger, 436.
 Hyoscyamus, The Alkaloidal Value of: A. W. Gerrard, 428.
 Hypnal, Preparation of: M. Demandre, 274.
 Hypnone, 76.
 Hypophosphite of Iron, Assay of: F. X. Moerk, 150.
 Hyposulphites: A. Fock and K. Klüss, 23.
 Hysterionica Baylahuen: H. H. Rusby, 179.
- I.
- Iceland Moss, Physiological Effects of Cetrarin, the Bitter Principle of: R. Kobert, 249.
 Ichthyol, Note on: H. Wyatt, 232.
 Ichthyol Preparations: H. Unna, 273.
 Illigera Pulchra, 43, 186.
 Ince, W. H., and W. R. Dunstan: Crystalline Alkaloid of Aconitum Napellus 43.
 Indene and Cinnamene in Coal-Tar: G. Kraemer and A. Spilker, 83.
 Indian Gums for Pharmacy Work: Dr. S. Rideal and W. E. Youle, 405.
 Indian Leguminous Plants, Investigation of, 183.
 Indian Oil of Geranium: F. W. Semmler, 219.
 Indigo, New Synthesis of: K. Heumann, 71.
 Indigo, New Synthesis of: L. Lederer, 71.
 Indigo, Synthesis of, from Anilido-acetic Acid (Phenylglycocine): L. Lederer, 71.
 Indigo-Red, Detection of, in Urine: O. Rosenbach, 117.
 Indole, 75.
 Infusion of Digitalis: F. Lascar, 257.
 Infusion of Digitalis, Gelatinization of: Dr. Foreke, 257.
 Ink for Rubber Stamps: E. Dieterich, 294.
 Ink for Writing on Zinc, 294.
 Introduction to the Year Book of Pharmacy, 1.
 Invert-Sugar, 122.
 Iodides, Bromides, and Chlorides, Qualitative Analysis of a Mixture of: F. A. Gooch and F. T. Brooks, 147.
 Iodides, Chlorides and Bromides, Detection of: G. Denigès, 145.
 Iodides, Estimation of: F. A. Gooch and P. E. Browning, 145.
 Iodides of Bismuth and Potassium: C. Astre, 26.
 Iodine, Estimation of Tannin by means of: A. Moullade, 132.
 Iodoantifebrin, 235.
 Iodoantipyrene, 235.
 Iodoform and Calomel, Influence of Light on a Powder containing: G. Roe, 267.
 Iodoformed Guaiacol: M. Picot, 276.
 Iodol, 75.
 Iodometry, Acidimetry, and Alkalimetry, Potassium Iodate as a Standard for: M. Gröger, 140.
 Iodophenine: L. Scholvien, 74.
 Iodo-Sulphate of Cinchonine, or Antiseptol: P. Yvon, 276.
 Ipecacuanha, Preparations of: W. H. Symons, 397.
 Ipecacuanha, Report upon: R. A. Cripps and A. Whitby, 385.
 Ipecacuanha, The Volatile Alkaloid of: E. M. Arndt, 56.
 Ipecacuanha Root, Assay of: E. M. Arndt, 164.

- Iron and Aluminium Sesquioxides, Relative Basicity of: E. A. Schneider, 23.
- Iron Malate, Solution of: G. M. Beringer, 272.
- Iron Wine: J. A. Forret, 257.
- Isobutylamine: H. Malbot, 64.
- Isobutylpiperidine, 245.
- Isochloralimide, 84.
- Isocinchonine: O. Hesse, 53.
- Isoquinoline: A. Edinger and E. Bossung, 55.
- Isotropylcocaine, 239.
- J.
- Jacquemin, G.: The Bouquet of Wines, 105.
- Jaffé, B.: The Purity of Glycerine, 188.
- Jahns, E.: The Alkaloids of Areca Nut, 61.
- Jalap, Resin of: J. P. Suess, 213.
- Jalapæ Extractum Alcoholicum: J. E. Wishart, 258.
- Jambul Bark: N. Wender, 168.
- Japaconitine, 453.
- Japanese Aconite, called Kusu-Uzu: A. Lubbe, 157.
- Japanese Aconite, called Shirakawa-Bushi: O. Lezius, 157.
- Japanese Cantharides: Dr. Bosetti, 231.
- Jardine, J.: Report on the Action of some Liquid and Solid Preparations of Cascara Sagrada, 482.
- Jervine, 58.
- Johnstone, W.: Copper in Cereals, 153.
- Jolles, A.: Detection of Bile Constituents in Urine, 119.
- Jolles, A.: New Test for Albumen in Urine, 118.
- Jolles, A.: The Ferrocyanide Test for Albumen in Urine, 119.
- Jorissen, A., and L. Grosjean: Solanidine from Potato Sprouts, 37.
- Juniper, Norwegian, Oil of: C. Nicolaysen, 217.
- K.
- Kairine, 75.
- Kander, M.: Tritopine, a new Opium Base, 45.
- Kaposi, M.: Mercurial Collodion as a Remedy for Warts, 279.
- Kathrein, S.: Detection of Bile Pigments in Urine, 119.
- Kelsey, F. D.: Antidote to the Poison of the Rattlesnake, 199.
- Keratin, The Uses of: H. Unna and M. Beirsdorff, 273.
- Kesso Oil: J. Bertram and E. Gilde-meister, 214.
- Kessyl Alcohol, 214.
- Kiliani H.: Digitouin and Digitogenin, 64, 65.
- Kissling, R.: Action of High Temperatures on Sodium Carbonate, 20.
- Klüss, K., and A. Fock: Hyposulphites, 23.
- Ko Shan Kwei (*see* article on Chinese Cinnamon), 170.
- Kobert, R.: Cadaverine and the Treatment of Cholera, 249.
- Kobert, R.: Ergot and its Preparations, 190.
- Kobert, R.: Physiological Effects of Cetrarin, the Bitter Principle of Iceland Moss, 249.
- Kohn, C. A.: Test for Glycerine, 138.
- König, G.: Constituents of the Roots of *Sanguinaria Canadensis*, 163.
- Kopsia Arborea, 185.
- Kopsia (*Calpicarpum*) *Albiflorum*, 185.
- Kopsia (*Calpicarpum*) *Roxburghii*, 185.
- Kopsia *Flavida*, 185.
- Kosobudski, M.: Ointment and Suppositories of Chrysarobin, 285.
- Kossel, A., and K. Obermüller: A New Method for the Saponification of Fats, Waxes, etc., 89.
- Kraemer, G., and A. Spilker: Indene and Cinnamene in Coal-Tar, 83.
- Kraetzer, H.: New Perfumes, 291.
- Krauss, G. A.: *Solanum Carolinense*, 178.
- Kremel, A.: Assay of *Colchicum* Seeds, 196.
- Kühling, O., and C. Liebermann: Hygrine, 39.
- Kühn, B., and F. Saeger: Estimation of Arsenic by Marsh's Method, 152.
- Kühn, M.: Composition of the Milk of Cows during Early and Late Periods of Lactation, 109.
- Külz, E.: Compounds of Glycuronic Acid, 81.
- Külz, E.: Formation of Cystin in Pancreatic Digestion, 114.
- Kuro-Moji Oil: W. Kwasnick, 221.
- Kusu-Uzu, Japanese Aconite: A. Lubbe, 157.

- Kwasnick, M., and K. Thümmel: Macassar Oil, 225.
 Kwasnick, W.: Kuro-Moji Oil, 221.
- L.
- Laborde, J. V.: Physiological Action of the Soluble Salts of Strontium and Calcium, 252.
 Lachaud, A., and C. Lepierre: New Double Chromates, 24.
 Lactalbumen, 108.
 Ladenburg, A.: Conversion of Tropidine into Tropine, 36.
 Ladenburg, A., and E. Merck: A New Alkaloid from Conium Maculatum, 46.
 Lævo-Cocaine, 239.
 Lambert, L.: Diuretin, 32.
 Langley, J. N., and W. L. Dickinson: Physiological Action of Pituri and Nicotine, 245.
 Lard, Detection of Adulteration in: E. Dieterich, 136.
 Lascar, F.: Infusion of Digitalis, 257.
 Lascelles, W.: Caoutchouc Solutions, 292.
 Lasia, 186.
 Laurotetanine: M. Greshoff, 42.
 Laurus Persea, 101.
 Lawrie, E.: New Therapeutic Properties of Thymol, 223.
 Lecco, M. T.: Detection of Mercury in Toxicological Investigations, 124.
 Leclerc, A.: Estimation of Starch, 121.
 Lederer, L.: New Synthesis of Indigo, 71.
 Lederer, L.: Synthesis of Indigo from Anilidoacetic Acid (Phenylglycocine), 71.
 Léger, E.: Combination of Camphor with Phenols, 84.
 Lehmann, E.: Siberian Cedar Nuts, 193.
 Lehmann, V., and M. Mori: Toxicity of Corn Cockle Seeds, 192.
 Lemoine, G.: Elder Bark as a Diuretic, 168.
 Lemon Juice: T. A. Ellwood, 263.
 Leopard-Tree, The Gum of: J. H. Maiden, 210.
 Lepierre, C., and A. Lachaud: New Double Chromates, 24.
 Lépine, R., and M. Barral: Destruction of Sugar in the Blood by a Ferment, 111.
 Leucodextrin, 98.
 Leuconotis Eugenifolia, 184.
 Levant Galbanum, 417.
 Levosin, A New Carbohydrate from Cereals: C. Tanret, 92.
 Levulose, 122.
 Lezius, O.: Japanese Aconite, called Shirakawa-Bushi, 157.
 Liebermann, C.: Ecgonine, 39.
 Liebermann, C., and O. Kühling: Hygrine, 39.
 Liebreich, O.: Cholesterin Fats in Man, 111.
 Ligno-Celluloses, Action of Nitric Acid on: C. F. Cross and E. J. Bevan, 91.
 Ligusticum, 188.
 Likiernik, A.: Lupeol, 67.
 Limonene, 219.
 Lindera Fericia, 221.
 Linebarger, C. E., and J. H. Long: American Fusel Oil, 28.
 Linossier, G.: Aspergillin, a Vegetable Hæmatin, 107.
 Lip Salve in Sticks, 290.
 Liquor Bismuthi, B. P.: P. Boa, 260.
 Liquor Bismuthi et Ammonie Citratis: D. Gorrie, 260.
 Liquor Strychnia, Note on Dispensing: T. Shepherd, 494.
 Liquorice, Elixir of: M. Dietel, 268.
 Litmus, Protection of Solution of, from Change: W. Duncan, 141.
 Litsæa Chrysocoma, 43.
 Litsæa Javanica, 43.
 Liversege, J. F.: Approximate Estimation of Alcohol in Tinctures, 255.
 Lobelia Inflata, Constituents of: C. Siebert, 174.
 Lobelia Purpurescens: J. H. Maiden, 174.
 Loco Weeds: T. J. Power and J. Cambier, 180.
 Loew, O.: Catalytic Decomposition of Ammonium Nitrite, 21.
 Loew, O.: Formation of Nitrous Acid and Ammonia from Free Nitrogen, 22.
 Loew, O.: Physiological Action of Hydrazine, 238.
 Loliine, 179.
 Lolium Temulentum: P. Antze, 179.
 Long, J. H., and C. E. Linebarger: American Fusel Oil, 28.
 Loeff, G.: Colorimetric Estimation of Nitrates in Water, 142.
 Lothian, J.: Unguentum Hydrargyri Nitratis, 263.

- Lozenges, Medicated, Report upon : F. Davis, 490.
- Lubbe, A. : Aconitine, 44.
- Lubbe, A. : Japanese Aconite, called Kusu-Uzu, 157.
- Lüdeking, C. : Qualitative Analysis of the Barium Group, 147.
- Luff, A. P. : Absorption of Drugs from Ointments, 286.
- Lupeol : A. Likiernik, 67.
- Lupetidine and Allied Substances, Physiological Action of, in Relation to their Chemical Constitution : A. Gürber, 245.
- Lupinus, 184.
- Lupinus Luteus, 67.
- Lusini, Prof. : Physiological Action of Thialdine and Carbothialdine, 246.
- Lusini, Prof. : Sulphaldehyde as a Hypnotic, 235.
- Lyaconitine, 458.
- Lycopersicum Esculentum : G. Brosi and T. Gigli, 194.
- Lycopodium Clavatum, 223.
- Lycopodium Oil, Constituents of : A. Bukowski, 223.
- M.
- Macassar Oil : K. Thümmel and M. Kwasnick, 225.
- Mace, Adulterated : M. Hefelmann, 193.
- Mace, Oil of : F. W. Semmler, 215.
- Maclura Aurantiaca, Composition of the Leaves of : A. Pizzi, 174.
- Macrozamia (Encephalartos) Gum : H. J. Maiden, 205.
- Macrozamia Perowskiana, 205, 206.
- Macrozamia Spiralis, 205, 206.
- MacWilliam, J. A. : A New Test for Proteids, 123.
- Magalhaes, A., and K. Buchka : Cytisine, 41.
- Maiden, J. H. : Drimys Aromatica and D. Dipetala, 172.
- Maiden, J. H. : Grass-Tree Gum, 210.
- Maiden, J. H. : Lobelia Purpurescens, 174.
- Maiden, J. H. : Macrozamia (Encephalartos) Gum, 205.
- Maiden, J. H. : Observations on the Gums yielded by two Species of Ceratopetalum, 208.
- Maiden, J. H. : The Gum of the Leopard-Tree, Flindersia Maculosa, 210.
- Maisch, J. M. : Florida Camphor, 223.
- Maisch, J. M. : Notes on some North American Medicinal Plants, 187.
- Majert, W., and A. Schmidt : Spermine and Piperazine (Piperazine), 72.
- Malate of Iron, Solution of : G. M. Beringer, 272.
- Malbot, H. : Isobutylamine, 64.
- Male-Fern (Aspidium Felix Mas), The Rhizome of : J. B. Nagelvoort, 158.
- Male-Fern, Fatal Effect of Oleo-Resin of, 275.
- Malic Acid, Potassium Acid Tartrate, Free Tartaric Acid, and Mineral Salts, Estimation of, in Wine : M. Schneider, 136.
- Malt, Extract of, with Castor Oil : S. M. Burroughs, 484.
- Maltase, 93.
- Maltodextrin, 93.
- Maltscheffsky, P. : Estimation of Tannin in Tea, 133.
- Manganese, Action of Hydrogen Peroxide on Oxygen Compounds of : A. Gorgeu, 24.
- Manganese, Volumetric Estimation of : G. Vortmann, 151.
- Mankowsky, A. : Constituents of the Root of Bryonia Dioica, 163.
- Manna from Eucalyptus Gunnii, Constituents of : F. W. Passmore, 201.
- Manures, Estimation of the Total Nitrogen in : E. Aubin and J. Quenot, 145.
- Mar, F. W., and F. A. Gooch : Direct Estimation of Chlorine in Mixtures of Alkaline Chlorides and Iodides, 146.
- Marcacci, A. : Conversion Products of Starch, 93.
- Marette, M. : Diuretin, 31.
- Marfori, P. : Physiological Action of Guaiacol, 233.
- Marie, T. : Cerotic Acid, 81.
- Marrubium Vulgare : J. W. Morrison, 178.
- Marsh's Test, Estimation of Arsenic by : B. Kühn and F. Saeger, 152.
- Massoy-Bark Oil, 86.
- McCall, Dr. : Therapeutic Properties of Salicylate of Cinchonidine, 245.
- McCullough, M. L. : Glycyrrhiza Lepidota, 158.
- McGowan, G. : Estimation of Nitrates, 142.

- McGowan, W.: Pilocarpine as an Antidote in Belladonna-Poisoning, 275.
- McLaren, J. B.: *Pilula Ferri Protochloridi*, 272.
- Medicated Lozenges, B.P., Report upon: F. Davis, 490.
- Melikoff, P., and P. Petrenko-Kritchenko: Derivatives of Angelic and Tiglic Acids, 81.
- Melodinus *Lævigatus*, 184.
- Melon Seeds, Constituents of: C. Forti, 194.
- Members, Alphabetical List of, 327.
- Members, Foreign and Colonial, List of, 321.
- Members, Honorary, List of, 320.
- Members, New, Election of, 362.
- Mentha Pulegium*, 187.
- Mentha Pulegium* Oil of: M. Pleissner, 219.
- Menthol Dentifrice Water, 281.
- Menthol-Glycerine-Cream, 284.
- Mentholated Cream, 284.
- Merck, E.: Constituents of *Sabadilla* Seeds, 195.
- Merck, E.: *Muawi Bark*, 168.
- Merck, E., and A. Ladenburg: A New Alkaloid from *Conium Maculatum*, 46.
- Mercurial Collodion as a Remedy for Warts: M. Kaposi, 279.
- Mercurial Ointment, Assay of: C. Thein, 263.
- Mercurial Ointment, Process for the Rapid Preparation of: M. Passérieux, 262.
- Mercuric Chloride and Antipyrine: M. Petsche, 73.
- Mercuric Chloride in Diphtheria: F. A. Coward, 250.
- Mercuric Chloride Pellets: C. J. Bond, 268.
- Mercuric Oxychloride, Crystalline: J. Volhard, 24.
- Mercuric Test for Mydriatic Alkaloids: A. W. Gerrard, 128.
- Mercurous Solutions, Detection of Silver in: F. X. Moerk, 151.
- Mercury, Detection of, in Toxicological Investigations: M. T. Lecco, 124.
- Mercury Salicylate, Solution of: M. Vacher, 269.
- Mesembryanthemum Acinaciforme*, 190.
- Messinger, J., and G. Vortmann: Volumetric Estimation of Phenols, 180.
- Methacetic, 75.
- Methocodine, 243.
- Methoxy-Antifebrin, 75.
- Methyl-Acetanilid, 75.
- Methyl-Strychnine, The Physiological Action of: J. Tillie, 246.
- Methylal as a Solvent for Odorous Principles, 292.
- Methylhydrastamide, 56.
- Methylmorphine Chloride and Methylcodeine Sulphate, 243.
- Methylphenacetin, a New Narcotic, 235.
- Methylthebaine Sulphate, 244.
- Meunier, J.: Conversion of Glucose into Sorbitol (Sorbite), 103.
- Meyer, E. v.: Source of Error in the Estimation of Sulphuric Acid, 141.
- Meyer, H.: Castor Oil, 224.
- Microcidine: M. Berlioz, 73.
- Migraine, Powder for, 278.
- Milk of Cows, Composition of, during Early and Late Periods of Lactation: M. Kühn, 109.
- Milk-Sugar as a Diuretic: Dr. Zawodski, 250.
- Milk, The Proteids of: W. D. Halliburton, 108.
- Milletia Atropurpurea*, 184.
- Mineral Acids, Detection of, in Vinegar: M. Balzer, 135.
- Mineral Waters, Estimation of Free and Combined Carbonic Acid in: H. Bretet, 144.
- Mistura Cretæ, 411.
- Mistura Olei Ricini: M. Conroy, 260.
- Mithaakkalkara, 159.
- Mittelmeier, H., and C. Scheibler: Gallisin, 105.
- Mittelmeier, H., and C. Scheibler: Starch and Dextrin, 94.
- Moerk, F. X.: Assay of Ferric Hypophosphite, 150.
- Moerk, F. X.: Detection of Silver in Solutions containing Mercurous Salts, 151.
- Moerk, F. X.: The Aloins, 205.
- Mohler, E.: Detection of Impurities in Alcohol, 129.
- Monesia Bark: P. G. Rozanoff, 167.
- Mori, M., and V. Lehmann: Toxicity of Corn Cockle Seeds, 192.
- Moritz, F., and W. Prausnitz: Phloridzin Diabetes, 247.
- Morphine, A Violet Colouring Matter derived from: P. Cazeneuve, 70.
- Morphine and its Derivatives, Physiological Action of: R. Stockman and D. B. Dott, 242.

- Morphine and Opium, Action of: W. Spitzer, 240.
Morphine, Derivatives of: W. Danckwortt, 46.
Morphine Ferrocyanide, 88.
Morphine Salts and Cherry-Laurel Water: T. Salzer, 264.
Morphine Sulphuric Ether and Nitrosomorphine, 243.
Morpurgo, J.: Test for the Purity of Essential Oil of Bitter Almonds, 221.
Morrison, J. W.: Marrubium Vulgare, 178.
Moss, J.: Cascara Sagrada and Extracts, 476.
Moss, J.: Note on Chaulmoogra Oil, 224.
Mosso, U.: Physiological Action of Cocaine, 239.
Moullade, A.: Estimation of Tannin by means of Iodine, 132.
Mouth Wash, Antiseptic, 282.
Mouth Wash for Preventing Dental Caries, 282.
Muawi Bark: E. Merck, 168.
Muawine, 168.
Müller, C.: An Oil from *Tilia Parvifolia*, 223.
Müller, W.: Cocaine Salts, 89.
Münzer, E.: Two New Antipyretics, 235.
Murrell, W.: Apomorphine and Apocodine as Expectorants, 248.
Murrell, W.: Therapeutic Properties of Guaiac Resin, 213.
Musk, Artificial: A. Baur, 70.
Mussi, U.: Detection of Coca Poisoning in Forensic Investigations, 126.
Mussi, U.: The Digestive Ferment in Fig Sap, 106.
Mycoderma Aceti, 105.
Mydriatic Alkaloids, The Mercuric Test for: A. W. Gerrard, 128.
Mydriatic Bases of the Solanaceæ: L. Schmidt and M. Schütte, 34.
Myristicin, 215.
Myrobalans and Algarobilla, The Tannins of: G. Zoelfell, 68.
Myronate of Potassium: P. Birkenwald, 86.
- N.
- Nagelvoort, J. B.: Short Methods for Assaying Opium and its Galenical Preparations, 200.
Nagelvoort, J. B.: The Rhizome of Male-Fern (*Aspidium Felix Mas*), 158.
Naphthol Camphoride, 84.
Naphthol, Elimination of, with the Urine: E. Desesquelle, 117.
Narceine Ferrocyanide, 88.
Narcotine Ferrocyanide, 83.
Narcotine, Thebaine, and their Derivatives, Physiological Action of: R. Stockman and D. B. Dott, 244.
Natal Aloes: E. M. Holmes, 203.
Natal Aloes, Notes on: J. M. Wood, 202.
Naylor, W. A. H.: Oleite, or Sulpho-Ricinoleate of Soda, 267.
Nectandra, 186.
Neriin, 170.
Nerium Oleander, Constituents of the Bark of: E. Pieszczyk, 170.
Nessler's Test, Effect of Temperature on: A. Hazen and H. W. Clark, 142.
Ngoi Ho Kwei (*see* article on Chinese Cinnamon), 170.
Nicolas, M.: Preparation of Pure Phosphoric Acid, 20.
Nicolaysen, C.: Norwegian Oil of Juniper, 217.
Nicotine: A. Pinner and R. Wolfenstein, 47.
Nicotine and Pituri, Physiological Action of: J. N. Langley and W. L. Dickinson, 245.
Nicotine, Constitution of: F. Blau, 47.
Nigaki, 173.
Nikolski, W., and J. Dogiel: Physiological Action of Curare, 198.
Nitrate of Sodium, Assay of: O. Foerster, 142.
Nitrates, A Rapid Method of Estimating in Potable Waters: G. Harrow, 148.
Nitrates, Colorimetric Estimation of, in Water: G. Loeff, 142.
Nitrates, Estimation of: G. McGowan, 142.
Nitric Acid, Action of, on the Ligno-Celluloses: C. F. Cross and E. J. Bevan, 91.
Nitric and Nitrous Acids, Estimation of, in Potable Waters: M. Rosenfeld, 148.
Nitride of Hydrogen, 19, 20.
Nitrite of Ammonium, Catalytic Decomposition of: O. Loew, 21.
Nitrobenzyl Chloride, 77.

- Nitrobenzylformanilid, 77.
 Nitrogen, Estimation of the Total, in Manures: E. Aubin and J. Quenot, 145.
 Nitrogen, Free, Formation of Nitrous Acid and Ammonia from: O. Loew, 22.
 Nitrogen, Organic, Comparison of the Methods in Use for Estimating: R. W. Oddy and J. B. Cohen, 144.
 Nitrosohydrazine Hippuric Acid, 19.
 Nitrous Acid and Ammonia, Formation of, from Free Nitrogen: O. Loew, 22.
 Norwegian Oil of Juniper: C. Nicolaysen, 217.
 Notaphæbe Umbellifera, 43.
 Nux Vomica and Opium, Note on a Proposed Method of Standardizing the Extracts of: M. Conroy, 447.
 Nux Vomica, Tincture of: A. J. Dey, 254.
- O.
- Oak-Tannin, Tannin, and Gallic Acid: C. Böttinger, 68.
 Oak Tannins, Tannic and Gallic Acids, Oxidation Products of: C. Böttinger, 70.
 Obermüller, K.: Reaction of Cholesterolin, 90.
 Obermüller, K.: The Chemical Formula of Cholesterolin, 90.
 Obermüller, K., and A. Kossel: A New Method for the Saponification of Fats, Waxes, etc., 89.
 Obolonski, N.: Detection of Colchicine in Forensic Investigations, 124.
 Ochrosia (Bleekaria) Kalocarpa, 185.
 Ochrosia (Lactaria) Acuminata, 185.
 Oddy, R. W., and J. B. Cohen: Comparison of the Methods in Use for Estimating Organic Nitrogen, 144.
 Oil, Castor: H. Meyer, 224.
 Oil, Castor, with Extract of Malt: S. M. Burroughs, 484.
 Oil, Chaulmoogra, Note on: J. Moss, 224.
 Oil, Cod-Liver: H. Unger, 229.
 Oil, Croton: A. Reuter, 224.
 Oil, Macassar: K. Thümmel and M. Kwasnick, 225.
 Oil of Aristolochia Reticulata: J. C. Peacock, 214.
 Oil of Asafœtida: F. W. Semmler, 218.
 Oil of Bergamot, 217.
 Oil of Bitter Almonds, Essential, Test for the Purity of: J. Morpurgo, 221.
 Oil of Cassia: E. Hirschsohn, 220.
 Oil of Cassia, Tests for the Purity of: E. Hirschsohn, 220.
 Oil of Citronella, Commercial: J. C. Umney, 215.
 Oil of Copaiba, Notes on the Estimation of: R. A. Cripps, 414.
 Oil of Eucalyptus: P. W. Squire, 222.
 Oil of Eucalyptus and Eucalyptol, some Notes on: R. H. Davies and T. H. Pearmain, 465.
 Oil of Fennel: O. Wallach and F. Hartmann, 215.
 Oil of Geranium, Indian: F. W. Semmler, 219.
 Oil of Juniper, Norwegian: C. Nicolaysen, 217.
 Oil of Kesso: J. Bertram and E. Gildemeister, 214.
 Oil of Kuro-Moji: W. Kwasnick, 221.
 Oil of Lycopodium, Constituents of: A. Bukowski, 223.
 Oil of Mace: F. W. Semmler, 215.
 Oil of Mentha Pulegium: M. Pleissner, 219.
 Oil of Peppermint: E. Hirschsohn, 219.
 Oil of Peppermint: E. Polenske, 218.
 Oil of Peppermint, Russian: H. Andres, 219.
 Oil of Rosemary: R. A. Cripps, 216.
 Oil of Sage (Salvia Officinalis), Poisonous Properties of: MM. Cadéac and Albin, 219.
 Oil of Sassafras: C. Pomeranz, 215.
 Oil of Sesame, Detection of, as an Adulterant in Olive Oil: J. F. Tocher, 226.
 Oil of Sesame, Isolation of a New Substance from: J. F. Tocher, 226.
 Oil of Stavesacre Seeds: M. Haensel, 214.
 Oil of Tilia Parvifolia: C. Müller, 223.
 Oil of Turpentine: R. G. Dunwoody, 86.
 Oil of Turpentine, Detection of Resin Oil in: E. Baudin, 140.
 Oil of Turpentine, Simple Method for the Detection of Petroleum in: S. J. Hinsdale, 140.

Oils, Essential, and Terpenes: O.

- Wallach, 86.
 Oils, Medicated, for Hypodermic Injection: A. Vicario, 238.
 Ointment and Suppositories of Chrysarobin: M. Kosobudski, 285.
 Ointment, Mercurial, Assay of: C. Thein, 263.
 Ointment, Mercurial, Process for the Rapid Preparation of: M. Passérieux, 262.
 Ointments, Absorption of Drugs from: A. P. Luff, 286.
 Olei Ricini Mistura: M. Conroy, 260.
 Oleite, or Sulpho-Ricinoleate of Soda: W. A. H. Naylor, 267.
 Oleo-Resin of Male Fern, Fatal Effects of, 275.
 Oleum Betulini Rectificatum (Birchwood Creosote): M. Pfrenger, 223.
 Olive Oil, Detection of Adulteration in: R. Brullé, 228.
 Olive Oil, Detection of Sesame Oil as an Adulterant in: J. F. Tocher, 226.
 Opioxyylon Serpentinum, 185.
 Opium, Assay of: E. Dieterich, 199.
 Opium and its Galenical Preparations, Short Methods for Assaying: J. B. Nagelvoort, 200.
 Opium and Morphine, Action of: W. Spitzer, 240.
 Opium and Nux Vomica, Note on a Proposed Method of Standardizing the Extracts of: M. Conroy, 447.
 Opium Base, Tritopine, a new: M. Kander, 45.
 Opium, Hungarian: A. Dier, 199.
 Opium used in Medicine, The: E. M. Holmes, 486.
 Orexin: A. Donner, 76.
 Organic Bases, A New Class of: C. Stoehr, 63.
 Ost, H.: Estimation of Sugar by means of Copper Potassium Carbonate, 121.
 Oswald, F.: Constituents of Star-Anise Fruit, 194.
 Oudemans, A. C.: Metallic Derivatives of Cupreine, 52.
 Oxydigitogenic Acid, 66.
 Oxygen Compounds of Manganese, Action of Hydrogen Peroxide on: A. Gorgeu, 24.
 Oxy nicotine, 47.
 Oxysparteine, 61.
 Ozonin: L. Schreiner, 294.

P.

- Paal, M.: Glutin-Peptide-Sublimated Hydrochloride, 269.
 Pachyrhizus Angulatus, 183.
 Pagés, C., and M. Arthus: Chemical Theory of the Coagulation of Blood, 107.
 Palembang Benzoin: E. M. Holmes, 213.
 Palisota Barteri, 197.
 Palmella Cruenta, 107.
 Palmelline, 107.
 Pancreatic Digestion, Formation of Cystin in: E. Külz, 114.
 Pancreatic Juice, Composition of, in Man: J. Zawadzki, 112.
 Pangium Edule, 187.
 Paracresotat of Sodium: H. Helbing, 80.
 Paraffin, Detection of, in Beeswax: H. Hager, 137.
 Paraiodoaniline, 235.
 Paraldehyde, Chloralamide and Sulphonol, 236.
 Parke, Surgeon, and E. M. Holmes: The Arrow Poison of the Pigmies, 196.
 Parpevoline, 245.
 Partheil, A.: Cytisine, 40.
 Partheil, A.: Identity of Cytisine and Ulexine, 42.
 Passérieux, M.: Process for the Rapid Preparation of Mercurial Ointment, 262.
 Passmore, F. W.: Constituents of Manna from Eucalyptus Gunnii, 201.
 Passmore, F. W.: Eucalyptus Honey, 230.
 Passmore, F. W.: The Chemistry of Organic Dyes, 71.
 Passmore, F. W., and E. Fischer: New Synthetic Sugars, 103.
 Paste for Window Polishing: E. Dieterich, 293.
 Patein, G.: Sulphines, 72.
 Paton, D. Noel: Albumen and Globulin in Urine, 114.
 Paul, B. H.: The Estimation of Caffeine (Theine) in Tea, 133.
 Paul, B. H., and A. J. Cownley: Amount of Theine in Tea, 134.
 Pavloff, M.: Physiological Action of Hyoscyne Hydrochloride, 244.
 Pea and Vetch, Alkaloidal Constituents of the: E. Schulze, 62.
 Peach Gum, Carbohydrates in: W. E. Stone, 92.

- Peacock, J. C. : *Heuchera Americana*, 163.
- Peacock, J. C. : Volatile Oil of *Aristolochia Reticulata*, 214.
- Peacock, J. C., and H. Trimble : The Astringent Principle of *Geranium Maculatum*, 165.
- Pearmain, T. H., and R. H. Davies : Some Notes on Oil of *Eucalyptus* and *Eucalyptol*, 465.
- Pehkschen, C. : The Alkaloids of the Rhizome of *Veratrum Album*, 57.
- Pellets of Perchloride of Mercury : C. J. Bond, 268.
- Pellitory, Sweet : D. Hooper, 159.
- Pennyroyal, 187.
- Peppermint, Oil of : E. Hirschsohn, 219.
- Peppermint, Oil of : E. Polenske, 218.
- Peppermint, Russian, Oil of : H. Andres, 219.
- Peppertree, 172, 188.
- Pepsin, Essence of : G. M. Beringer, 276.
- Perchloride of Mercury Pellets : C. J. Bond, 268.
- Perfumes, New : H. Kraetzer, 291.
- Perfumes, New Formulæ for, 290.
- Peroxide of Hydrogen, Action of, on Oxygen Compounds of Manganese : A. Gorgeu, 24.
- Peroxide of Hydrogen, Detection of Traces of : T. Fairley, 140.
- Persea Gratissima (see article on New Synthetic Sugars), 103.
- Persian Galbanum, Liquid : E. M. Holmes, 417.
- Petit, A., Apyonin, 275.
- Petrenko-Kritschenko, P., and P. Melikoff : Derivatives of Angelic and Tiglic Acids, 81.
- Petroleum, Simple Method for the Detection of, in Oil of Turpentine : S. J. Hinsdale, 140.
- Petsche, M. : Antipyrine and Mercuric Chloride, 73.
- Pfeiffer, L. : Injurious Effects of Sulphurous Acid present in Wines, 277.
- Pfrenger, M. : Birchwood Creosote (*Oleum Betulini Rectificatum*), 223.
- Phenacetin, 75.
- Phenacetin and Antifebrin, Separation of : H. Will, 128.
- Phenacetin, Antifebrin and Exalgin in Neuralgia : T. P. Thomson, 274.
- Phenerythene, 84.
- Phenocoll, Hydrochlorate of : F. G. Hertel, 238.
- Phenol Camphoride, 84.
- Phenols, Combination of Camphor with : E. Léger, 84.
- Phenols, Volumetric Estimation of : J. Messinger and G. Vortmann, 130.
- Phenyl-dimethyl-pyrazolone, 75.
- Phenyldihydrochinazoline, 76.
- Phenylglycocine (Anilidoacetic Acid), Synthesis of Indigo from : L. Lederer, 71.
- Phenylglycuronic Acid, 81.
- Phenylitaconic Acid : R. Fittig and P. Röders, 82.
- Phenylon, 75.
- Phenylsalicylic Acid : C. Arbenz, 31.
- Phipson, T. L. : Vegetable Hæmatin, 107.
- Phloretic Acid, 247.
- Phloretin, 247.
- Phloridzin Diabetes : F. Moritz and W. Prausnitz, 247.
- Phloroglucinol, 247.
- Phlox Carolina, Note on : H. G. Greenish, 160.
- Phosphoric Acid, Glacial : J. Hodgkin, 437.
- Phosphoric Acid, Preparation of Pure : M. Nicolas, 20.
- Photobacterium Phosphorescens, 94.
- Phytolacca Dioica, Formation of Raphides in : G. Acqua, 189.
- Piazine, 74.
- Pickering, S. W. : The Supposed Hydrates of Alcohol, 27.
- Picot, M. : Iodoformated Guaiacol, 276.
- Picraconitine, 459.
- Picrasma Eilantoides : MM. Shimomajama and Hirano, 173.
- Pictet, M. : Purification of Chloroform by Cold, 27.
- Pieszczek, E. : Constituents of the Bark of *Nerium Oleander*, 170.
- Pill Coating : D. Hughes Davies, 261.
- Pill Excipients : J. Findlay, 261.
- Pilocarpine as an Antidote in Belladonna-Poisoning : W. McGowan, 275.
- Pilocarpine Ferrocyanide, 83.
- Piloty, O., and E. Fischer : Synthesis of Glycuronic Acid, 80.
- Pilula Ferri Protochloridi : J. B. McLaren, 274.

- Pinner, A., and R. Wolfenstein: Nicotine, 47.
- Pinus Cembra, 193.
- Piper Crassipes, 193.
- Piperazidine as a Solvent of Uric Acid, 72.
- Piperazidine, Identity of, with Diethylenediamine: A. W. v. Hofmann, 72.
- Piperazine (Piperazidine) and Spermine: W. Majert and A. Schmidt, 72.
- Piperidine, 74, 245.
- Pisum Sativum, 62.
- Pithecolobium Bigeminum, 184.
- Pithecolobium Saman, 184.
- Pituri and Nicotine, Physiological Action of: J. N. Langley and W. L. Dickinson, 245.
- Pizzi, A.: Composition of the Leaves of *Maclura Aurantiaca*, 174.
- Planta, A. v.: Constituents of *Stachys Tuberifera*, 164.
- Plants growing in the Dutch Indies, Chemical Notes on: M. Greshoff, 182.
- Plants, North American Medicinal, Notes on: J. M. Maisch, 187.
- Plants, Parasitical: A. Chatin, 190.
- Pleissner, M.: Oil of *Mentha Pulegium*, 219.
- Plumbago Rosea, 185.
- Pöhl, A.: Spermine, 72.
- Pöhl, J.: Colloid Carbohydrates, 91.
- Poeleh Pandak, 185.
- Poisons, Organic and Inorganic, Detection and Estimation of, in Corpses: A. Seyda, 125.
- Poleck, T., and K. Thümmel: Detection of Alcohol in Commercial Ethyl-Ether, 130.
- Polenske, E.: Oil of Peppermint, 218.
- Polish for Furniture, 293.
- Polyporus Officinalis, 249.
- Pomegranate Root Bark: E. Aweng, 169.
- Pomegranate Root Bark: J. E. de Vrij, 169.
- Pomegranate Root Bark from Java: M. Stoeder, 168.
- Pomeranz, C.: Oil of Sassafras, 215.
- Popoff, M.: Influence of Cooking on the Digestion of Beef and Fish, 113.
- Portes, L.: Resopyrine, 73.
- Potable Waters, A Rapid Method of Estimating Nitrates in: G. Harrow, 143.
- Potable Waters, Estimation of Nitric and Nitrous Acids in: M. Rosenfeld, 143.
- Potassium Acid Tartrate, Free Tartaric Acid, Malic Acid, and Mineral Salts, Estimation of, in Wine: M. Schneider, 136.
- Potassium Ferrocyanide, Physiological Action of: P. Combemale and M. Dubiquet, 251.
- Potassium Iodate as a Standard for Iodometry, Acidimetry, and Alkalimetry: M. Gröger, 140.
- Potassium Myronate: P. Birkenwald, 86.
- Potassium Permanganate, Action of Arseniuretted Hydrogen on: D. Tivoli, 24.
- Potato Sprouts, Solanidine from: A. Jorissen and L. Grosjean, 37.
- Pothomorphe (Cubeba) Mollissima, 193.
- Poulsion, E.: The Pharmacology of the Cocaine Group, 239.
- Power, T. J., and J. Cambier: Loco Weeds, 180.
- Prausnitz, W., and F. Moritz: Phloridzin Diabetes, 247.
- Presentation Copies of the Year Book of Pharmacy, to whom forwarded, 355.
- Propyllopetidine, 245.
- Proteids, A New Test for: J. A. MacWilliam, 123.
- Proteids of Milk: W. D. Halliburton, 108.
- Protopine, 163, 175.
- Protoveratridine, 59.
- Protoveratrine, 59.
- Pseudoaconitine, 453.
- Pseudochrosia Glomerata, 185.
- Pseudoconhydrine, 47.
- Pseudojervine, 58.
- Ptomaines: O. de Coninck, 64.
- Puckner, W. A.: Constituents of Commercial Asafetida, 211.
- Pulegone, 219.
- Punica Granatum, 168.
- Pygium Latifolium, 186.
- Pygium Parviflorum, 186.
- Pyrazine, 74, 75.
- Pyrazol, 74.
- Pyrazoline, 74, 75.
- Pyrazolone, 74, 75.
- Pyrethrum Flowers, The Toxic Principle of: F. Schlagdenhauffen and E. Reeb, 176.
- Pyridine, 74.
- Pyridone, 74.

Pyroglutamic Acid, 75.
 Pyrone, 74.
 Pyrrol, 74, 75.
 Pyrrolidine, 74.
 Pyrroline, 74.

Q.

Quenot, J., and E. Aubin: Estimation of the Total Nitrogen in Manures, 145.
 Quercus Alba, 188.
 Quercus Palustris, 189.
 Quinia Tinetura Ammoniata: H. D. Adcock, 254.
 Quinidine Ferrocyanide, 33.
 Quinine, Albuminate of: M. Tarozyi, 51.
 Quinine and Antipyrine, Valerianates of, as Remedial Agents: M. Sochaczewski, 275.
 Quinine, Cinchonidine and their Isomers, Observations on: O. Hesse, 47.
 Quinine Ferrocyanide, 33.
 Quinine, Transformation of Cupreine into: E. Grimaux and A. Arnaud, 51.
 Quinolglycuronic Acid, 81.
 Quinoline, Bromo-Derivatives of: A. Claus and A. Welter, 55.
 Quinone, 74.

R.

Radenhausen, R., and T. Curtius: Hydrogen Nitride (Azoimide), 20.
 Randia Dumetorum: Sir J. Sawyer, 182.
 Ransom, F.: Note on the Constituents of Henbane Seed, 434.
 Raphides, Formation of, in *Phytolacca Dioica*: G. Acqua, 189.
 Raspberries, Syrup of: E. Dieterich, 270.
 Rauwolfia Canescens, 184.
 Rauwolfia (Cyrtosiphonia) Specabilis and Madurensis, 185.
 Rauwolfia (Ophioxylon) Serpentina and Trifoliata, 185.
 Reception and Conversazione (British Pharmaceutical Conference), 511.
 Reeb, E., and F. Schlagdenhauffen: The Toxic Principle of *Pyrethrum* Flowers, 176.
 Resin of Guaiac, Therapeutic Properties of: W. Murrell, 213.
 Resin of Jalap: J. P. Suess, 213.

Resin Oil, Detection of, in Oil of Turpentine: E. Baudin, 140.
 Resins, Gum-Resins, and Balsams: M. Bamberger, 212.
 Resins, Solid Fats, and Waxes, Simple Method for Determining the Specific Gravity of: A. Gawalowski, 228.
 Resopyrine: L. Portes, 73.
 Resorcin and Thymol, Detection of: H. Bornträger, 130.
 Resorcin Spray in Whooping-Cough: J. W. Farlow, 276.
 Resorcinol Camphoride, 84.
 Resorcinolglycuronic Acid, 81.
 Reuter, A.: Croton Oil, 224.
 Reuter, L.: Tragacanth, 208.
 Reyhler, A., and de Wilde: Preparation of Chlorine for Technical Purposes, 20.
 Rhamnus Californica: H. Brandyle, 172.
 Rhamnus Catharticus, 172.
 Rhamnus Frangula, 172.
 Rhamnus Purshiana, 172.
 Rhamnus Tomentella, 172.
 Rhus Glabra, 189.
 Rhynceodia (Cercocoma) Macrantha, 186.
 Richards, E., and F. A. Rogers: The Aconites and Aconitines, 45.
 Richardson, A.: The Decomposition of Silver Chloride by Light, 23.
 Riches, F. F., and J. Dunning: Saffron, its Adulterations and their Mode of Detection, 177.
 Rideal, Dr. S., and W. E. Youle: Indian Gums for Pharmacy Work, 405.
 Ringer, S., and H. Sainsbury: Influence of Salts on Clothing, 107.
 Ritsert, E.: Cause of the Rancidity of Fats, 88.
 Ritsert, E.: Tests for the Purity of Antifebrin, 128.
 Röders, P., and R. Fittig: Phenylitaconic Acid, 82.
 Roe, G.: Influence of Light on a Powder containing Iodoform and Calomel, 267.
 Rogers, F. A., and E. Richards: The Aconites and Aconitines, 45.
 Rosa Canina, Vanillin from: A. Schneegans, 68.
 Rosaginin, 170.
 Rose Powder, 290.
 Rosemary, Oil of: R. A. Cripps, 216.
 Rosenbach, O.: Detection of Indigo-Red in Urine, 117.

- Rosenfeld, M.: Estimation of Nitric and Nitrous Acids in Potable Waters, 143.
- Röttger, H.: The Purity of Beeswax, 230.
- Rozanoff, P. G.: Monesia Bark, 167.
- Rozsnyai, M.: Tinctura Ferri Formatis, 271.
- Rubner, M.: Detection of Carbonic Oxide in Blood, 111.
- Rusby, H. H.: Haplopappus Baylahuen (*Hysterionica Baylahuen*), 179.
- Russian Oil of Peppermint: H. Andres, 219.
- S.
- Sabadilla Seeds, Constituents of: E. Merck, 195.
- Sabadine, 195.
- Sabadinine, 195.
- Saccharin, Effect of, on the Digestion of Albuminoids: A. Stutzer, 113.
- Saeger, F., and B. Kühn: Estimation of Arsenic by Marsh's Method, 152.
- Saffron, its Adulterations and their Mode of Detection: F. F. Riches and J. Dunning, 177.
- Sage (*Salvia Officinalis*), Poisonous Properties of the Oil of: MM. Cadéac and Albin, 219.
- Sainsbury, H., and S. Ringer: Influence of Salts on Clotting, 107.
- Salicyl-Bromanilid, 274.
- Salicylate of Bismuth: H. Causse, 26.
- Salicylate of Cinchonidine, Therapeutic Properties of: Dr. McCall, 245.
- Salicylate of Mercury, Solution of: M. Vacher, 269.
- Salicylic Acid Lotion for Dandruff: E. Dieterich, 280.
- Salicylic Acid of Commerce, Constituents of, and their Physiological Action: W. R. Dunstan, O. F. C. Bloch and M. Charteris, 28.
- Salicylic Acid Shampoo: E. Dieterich, 233.
- Salicylic and Cresotic Acids: M. Charteris, 31.
- Salicylic Camphoride, 84.
- Salkowski, E.: The Occurrence of Hæmatoporphyrin in Urine, 116.
- Salol Camphoride, 84.
- Salt, Effect of, on Digestion: A. Stutzer, 112.
- Salvia Officinalis*, Poisonous Properties of the Oil of: MM. Cadéac and Albin, 219.
- Salzberger, G.: The Alkaloids of the Rhizome of *Veratrum Album*, 58.
- Salzer, T.: Morphine Salts and Cherry-Laurel Water, 264.
- Sambucus Nigra*, 168.
- Sanguinaria Canadensis*, Constituents of the Roots of: G. König, 163.
- Sanguinarine*, 163.
- Santoninoxime and its Derivatives: P. Gucci, 66.
- Sassafras, Oil of: C. Pomeranz, 215.
- Saupe, M.: Determination of the Fatty Acids in Soap, 139.
- Sawyer, Sir J.: *Randia Dumetorum*, 182.
- Scala, A.: Estimation of Formic Acid in the Presence of Acetic and Butyric Acids, 123.
- Scammony, Assay of: P. Boa, 212.
- Schall, C., and C. Dralle: Brazilin, 68.
- Scheerer, M.: *Ceratum Salicylatum*, 283.
- Scheibler, C., and H. Mittelmeier: Gallisin, 105.
- Scheibler, C., and H. Mittelmeier: Starch and Dextrin, 94.
- Schell, E.: A New Reaction of Cocaine Hydrochlorate, 127.
- Schinus Molle*, 188.
- Schlagdenhauffen, F., and E. Reeb: The Toxic Principle of *Pyrethrum* Flowers, 176.
- Schleichera Trijuga*, 225.
- Schmidt, A., and W. Majert: Spermine and Piperazine (*Piperazine*), 72.
- Schmidt, E., and M. Schütte: The Mydriatic Bases of the *Solanaceæ*, 34.
- Schmidt, E., and M. Wernecke: Caffedine, 40.
- Schneegans, A.: *Anagallis Arvensis*, 166.
- Schneegans, A.: Vanillin from *Rosa Canina*, 68.
- Schneider, E. A.: Relative Basicity of the Hydrated Sesquioxides of Iron and Aluminium, 23.
- Schneider, M.: Estimation of Acid Potassium Tartrate, Free Tartaric Acid, Malic Acid, and Mineral Salts in Wine, 186.
- Scholvein, L.: Iodophenine, 74.

- Schöndorff, B.: The Influence of Copious Water Drinking on the Excretion of Uric Acid, 115.
- Schreiner, L.: Ozonin, 294.
- Schulze, E.: Alkaloidal Constituents of the Pea and Vetch, 62.
- Schütte, M., and E. Schmidt: The Mydriatic Bases of the Solanaceæ, 84.
- G.: Cannabis Indica in Indigestion, 175.
- Selle, F.: Constituents of Chelidonium Majus, 175.
- Semmler, F. W.: Essential Oil of Asafetida, 213.
- Semmler, F. W.: Indian Oil of Geranium, 219.
- Semmler, F. W.: Oil of Mace, 215.
- Sesame Oil, Detection of, as an Adulterant in Olive Oil: J. F. Tocher, 226.
- Sesame Oil, Isolation of a new Substance from: J. F. Tocher, 226.
- Sesquioxides of Iron and Aluminium, Hydrated Relative Basicity of: E. A. Schneider, 23.
- Sestini, F. and L.: Ammoniacal Fermentation of Uric Acid, 115.
- Seyda, A.: Detection and Estimation of Organic and Inorganic Poisons in Corpses, 123.
- Shepherd, T.: Note on Dispensing Liquor Strychniæ, 494.
- Shimojama, M., and M. Hirano: Picrosma Eilantoides, 173.
- Shirakawa-Bushi, Japanese Aconite: O. Lezius, 157.
- Shirakawa-Uzu, 157.
- Shirakawauzuware, 44.
- Siberian Cedar Nuts: E. Lehmann, 193.
- Siebert, C.: Constituents of Lobelia Inflata, 174.
- Sierra Salvia, 177.
- Silber, P., and G. Ciamician: Hydrocotoin, a Constituent of Coto-Bark, 55.
- Silva, F. da: A New Reaction of Cocaine, 127.
- Silver Chloride, The Decomposition of, by Light: A. Richardson, 23.
- Silver, Detection of, in Solutions containing Mercurous Salts: F. X. Moerk, 151.
- Sinapis Juncea, 86.
- Snow, H. W.: Caffeine Salts, 40.
- Soap, Determination of the Fatty Acids in: M. Saupe, 139.
- Soap, Estimation of Glycerine in: L. J. Spencer, 139.
- Soap, Fluid Glycerine, 284.
- Soap for Removing Stains, 292.
- Soap Plant, Californian, Constituents of: H. Trimble, 164.
- Sochaczewski, M.: Valerianates of Antipyrine and Quinine as Remedial Agents, 275.
- Societies and Associations invited to send Delegates to the Annual Meeting, 353.
- Sodii Salicylas Purificata, 30.
- Sodium Carbonate, Action of High Temperatures on: R. Kissling, 20.
- Sodium Nitrate, Assay of: O. Foerster, 142.
- Sodium Paracresotate: H. Helbing, 30.
- Sodium-Theobromine (*see* article on Diuretin), 31.
- Sodium Sulpholeate, The Dermatological Value of: G. H. Fox, 252.
- Sodium Tellurate, Therapeutic Properties of: P. Combemale, 251.
- Sodiumformanilid, 77.
- Solanaceæ, The Mydriatic Bases of: E. Schmidt and M. Schütte, 34.
- Solanic Acid, 178.
- Solanidine, 178.
- Solanidine from Potato Sprouts: A. Jorissen and L. Grosjean, 37.
- Solanine, 178.
- Solanine and its Micro-Chemical Reactions, Distribution of: M. E. Wotczal, 37.
- Solanum Carolinense: G. A. Krauss, 178.
- Soltsien, P.: Volumetric Estimation of Chromates, Barium Salts, and Sulphates, 149.
- Sophora Angustifolia, 183.
- Sophora Speciosa, 183.
- Sophora Tomentosa, 183.
- Sorbitol (Sorbite), Conversion of Glucose into: J. Meunier, 103.
- Sorbus Aucuparia (*see* article on Reduction of Fruit Sugar), 104.
- Spanton, M.: Beef Tea, 277.
- Sparteïne: F. B. Ahrens, 61.
- Sparteïne Ferrocyanide, 33.
- Spartium, 184.
- Spehr, P.: Ephedra Monostachya, 167.
- Spencer, L. J.: Estimation of Glycerine in Soap, 139.
- Spermine: A. Poehl, 72.
- Spermine and Piperazine (Piperazidine): W. Majert and A. Schmidt, 72.

- Spica, P., and F. Ciotto: Detection of Atropine in Forensic Investigations, 124.
- Spigelia Marilandica, 160.
- Spilker, A., and G. Kraemar, Indene and Cinnamene in Coal-Tar, 88.
- Spitzer, W.: Action of Opium and Morphine, 240.
- Squire, P. W.: Eucalyptus Oil, 222.
- Stachys Tuberifera, Constituents of: A. v. Planta, 164.
- Star-Anise Fruit, Constituents of: F. Oswald, 194.
- Starch and Dextrin: C. Scheibler and H. Mittelmeier, 94.
- Starch, Conversion Products of: A. Marcacci, 93.
- Starch, Estimation of: A. Leclerc, 121.
- Starch, Fermentation of, by the Butyric Ferment: A. Villiers, 104.
- Stavesacre Seeds, Oil of: M. Haensel, 214.
- Sterilisation of Drinking Water, 277.
- Stockman, R.: Excretion of Balsams in the Urine, 116.
- Stockman, R., and D. B. Dott: Physiological Action of Morphine and its Derivatives, 242.
- Stockman, R., and D. B. Dott: Physiological Action of Thebaine, Narcotine, and their Derivatives, 244.
- Stoeder, M.: Pomegranate Root Bark from Java, 168.
- Stoehr, C.: A New Class of Organic Bases, 63.
- Stoehr, C.: Strychnine, 42.
- Stone, W. E.: Carbohydrates in Peach Gum, 92.
- Stransky, S.: Veratrine, 57.
- Strontium and Barium, Quantitative Separation of: K. Fresenius, 148.
- Strontium and Calcium, Physiological Action of the Soluble Salts of: J. V. Laborde, 252.
- Strychnine Liquor, Note on Dispensing, T. Shepherd, 494.
- Strychnine: C. Stoehr, 42.
- Strychnine: J. Tafel, 42.
- Strychnine and Brucine: H. Beckurts, 42.
- Strychnine Ferrocyanide, 83.
- Strychnos Icaja, 197.
- Strychnos Nux-Vomica, The Leaves of: D. Hooper, 173.
- Stuart, T. P. Anderson: The so-called Eucalyptus Honey of Commerce, 280.
- Stutzer, A.: Effect of Saccharin on the Digestion of Albuminoids, 113.
- Stutzer, A.: Effect of Salt on Digestion, 112.
- Styracol as a Remedy for Phthisis: A. Haas, 233.
- Suess, J. P.: Resin of Jalap, 216.
- Sugar, Destruction of, in the Blood by a Ferment: R. Lépine and M. Barral, 111.
- Sugar, Estimation of, by means of Copper Potassium Carbonate Solution: H. Ost, 121.
- Sugar, Estimation of, in Urine: U. Haussmann, 120.
- Sugar (Fruit), Reduction of: E. Fischer, 104.
- Sugar Group, Syntheses in the: E. Fischer, 95.
- Sugar, Invert, Alcoholic Fermentation of: U. Gayon and E. Dubourg, 105.
- Sugar of Milk as a Diuretic: Dr. Zawodski, 250.
- Sugar, Synthetical Formation of a New, from Glucose: E. Fischer, 104.
- Sugars, New Synthetic: E. Fischer and F. W. Passmore, 103.
- Sulphaldehyde as a Hypnotic: Prof. Lusini, 235.
- Sulphates, Alkaline, Reduction of by Carbon: M. Berthelot, 21.
- Sulphates, Chromates, and Barium Salts, Volumetric Estimation of: P. Soltsien, 149.
- Sulphines: G. Patein, 72.
- Sulphate of Zinc for Antiseptic Dressings: C. R. C. Tichborne, 283.
- Sulphites, Estimation of Alkalies in Presence of: J. Grant and J. B. Cohen, 141.
- Sulpho-Ricinoleate of Soda: W. A. H. Naylor, 267.
- Sulpholeate of Sodium, The Dermatological Value of: G. H. Fox, 252.
- Sulphonol, Paraldehyde and Chloralamide, 236.
- Sulphuric Acid, Action of Metals on: A. Ditte, 25.
- Sulphuric Acid, Source of Error in the Estimation of: E. v. Meyer, 141.

Sulphurous Acid, Injurious Effects of, in Wines: L. Pfeiffer, 277.
 Suppositories and Ointment of Chrysarobin: M. Kosobudski, 285.
 Suppositories, Glycerine: M. Balland, 285.
 Symons, W. H.: Preparations of Ipecacuanha, 397.
 Syrup of Raspberries: E. Dieterich, 270.
 Syrupus Eriodictyi, 181.

T.

Tabernamontana Sphærocarpa, 185.
 Tafel, J.: Strychnine, 42.
 Tahara, Y.: Constituents of the Seeds of Cataputiæ Minoris, 195.
 Tanacetum Umbelliferum, 152.
 Tanghinia Venenifera, 186.
 Tannic and Gallic Acids and Oak Tannins, Oxidation Products of: C. Böttinger, 70.
 Tannin, A New Reaction of: C. Böttinger, 131.
 Tannin, Estimation of, by means of Iodine: A. Moullade, 132.
 Tannin, Estimation of, in Tea: P. Maltseffsky, 133.
 Tannin Extracts: C. Böttinger, 69.
 Tannin, Oak-Tannin, and Gallic Acid: C. Böttinger, 68.
 Tannins, Manufacture of Decolorised: A. Villon, 69.
 Tannins of Algarobilla and of Myrobalans: G. Zoelfell, 68.
 Tanret, C.: Levosin, a new Carbohydrate from Cereals, 92.
 Tarozyi, M.: Albuminate of Quinine, 51.
 Tartaric Acid, Potassium Acid Tartrate, Malic Acid, and Mineral Salts, Estimation of in Wine: M. Schneider, 136.
 Tea, Amount of Theine in: B. H. Paul and A. J. Cownley, 134.
 Tea, Estimation of Tannin in: P. Maltseffsky, 133.
 Tellurate of Sodium, Therapeutic Properties of: P. Combemale, 251.
 Temulentin Acid, 179.
 Temulentine, 179.
 Tephrosia Vogelii, 197.
 Terpenes and Essential Oils: O. Wallach, 86.
 Tetranchera Amara, 43.
 Tetranchera Citrata, 43.
 Tetranchera Intermedia, 43.
 Tetranchera Lurida, 43.

Thalline, 75.
 Thebaine, Narcotine, and their Derivatives, Physiological Action of: R. Stockman and D. B. Dott, 244.
 Thein, C.: Assay of Mercurial Ointment, 263.
 Theine, Amount of, in Tea: B. H. Paul and A. J. Cownley, 134.
 Theine (Caffeine), The Estimation of, in Tea: B. H. Paul, 133.
 Thermofugin, 75.
 Thialdehyde, 235.
 Thialdine and Carbothialdine, Physiological Action of: Prof. Lusini, 246.
 Thiofurfuran, 75.
 Thionaphthene, 75.
 Thiophene, 74, 75.
 Thomson, T. P.: Antifebrin, Phenacetin and Exalgin in Neuralgia, 274.
 Thümmel, K., and M. Kwasnick: Macassar Oil, 225.
 Thümmel, K., and T. Poleck: Detection of Alcohol in Commercial Ethyl-Ether, 130.
 Thymol and Resorcin, Detection of: H. Bornträger, 130.
 Thymol, New Therapeutic Properties of: E. Lawrie, 223.
 Thymolglycuronic Acid, 81.
 Tichborne, C. R. C.: Sulphite of Zinc for Antiseptic Dressings, 283.
 Tiglic and Angelic Acids, Derivatives of: P. Melikoff and P. Petrenko-Kritchenko, 81.
 Tilia Parvifolia, An Oil from: C. Müller, 223.
 Tillie, J.: Physiological Action of Curare, 197.
 Tillie, J., The Physiological Action of Methyl-Strychnine, 246.
 Tinctura Ferri Formatis: M. Rozsnyai, 271.
 Tinctura Hæmostyptica: H. Fritsch, 272.
 Tinctura Quiniæ Ammoniata: H. D. Adcock, 254.
 Tincture of Henbane, 495.
 Tincture of Nux Vomica: A. J. Dey, 254.
 Tinctures, Approximate Estimation of Alcohol in: J. F. Liverseege, 255.
 Tinctures, Pharmacopœial, The Solvent Action of Alcohol of different Degrees of strength on some of the Drugs used in making: E. H. Farr and R. Wright, 253, 495.

- Tinctures, Preparation of: M. Vauthier, 254.
- Tivoli, D.: Action of Arseniuretted Hydrogen on Potassium Permanganate, 24.
- Tobacco Leaves, Mineral Constituents of: J. M. van Bemmelen, 175.
- Tocher, J. F.: Detection of Sesame Oil as an Adulterant in Olive Oil, 226.
- Tocher, J. F.: Isolation of a New Substance from Sesame Oil, 226.
- Tooth Soap, 278.
- Toothache Drops, 278.
- Tragacanth: L. Reuter, 208.
- Traub, M. C.: Extractum Cinchonæ Liquidum, 259.
- Trichloracetic Acid as a Caustic: A. H. Ehrmann, 278.
- Trimble, H.: Constituents of the Californian Soap Plant, *Chlorogalum Pomeridianum*, 164.
- Trimble, H.: Some American Galls collected in the Neighbourhood of Philadelphia, 188.
- Trimble H., and J. C. Peacock: The Astringent Principle of *Geranium Maculatum*, 165.
- Tritopine, a new Opium Base: M. Kander, 45.
- Tropidine: A. Einhorn, 36.
- Tropidine, Conversion of, into Tropine: A. Ladenburg, 36.
- Turpentine, Oil of: R. G. Dunwoody, 86.
- Turpentine, Oil of, Detection of Resin Oil in: E. Baudin, 140.
- Turpentine, Oil of, Simple Method for the Detection of Petroleum in: S. J. Hinsdale, 140.
- Turpentineglycuronic Acid, 81.
- Tylophora Asthmatica, Presence of an Alkaloid in: D. Hooper, 165.
- Tylophorine, 166.
- Tyrosine (*see* article on Constituents of *Stachys Tuberifera*), 164.
- U.
- Ulex, 184.
- Ulex Europæus, 41.
- Ulexine and Cytisine, Identity of: A. Partheil, 42.
- Umney, J. C.: Commercial Oil of Citronella, 215.
- Unger, H.: Cod-Liver Oil, 229.
- Unguentum Hydrargyri Nitratis: J. Lothian, 268.
- Unna, H.: Ichthyol Preparations, 278.
- Unna, H., and M. Beirsdorff: The Uses of Keratin, 278.
- Unona Lucidula, 197.
- Uranium Salts, The Toxic Action of: M. Woroschilsky, 251.
- Urea, Preparation of: J. Volhard, 28.
- Uric Acid, Ammoniacal Fermentation of: F. and L. Sestini, 115.
- Uric Acid, Estimation of, in Human Urine: W. Camerer, 118.
- Uric Acid, Piperazidine as a Solvent of, 72.
- Uric Acid, The Influence of copious Water Drinking on the Excretion of: B. Schöndorff, 115.
- Urine, Albumen and Globulin in: D. Noel Paton, 114.
- Urine, Cystin in: S. Delépine, 114.
- Urine, Detection of Bile Constituents in: A. Jolles, 119.
- Urine, Detection of Bile Pigments in: S. Kathrein, 119.
- Urine, Detection of Indigo-Red in: O. Rosenbach, 117.
- Urine, Elimination of Naphthol with: E. Desesquelle, 117.
- Urine, Estimation of Acetone in: H. Huppert, 120.
- Urine, Estimation of Sugar in: U. Haussmann, 120.
- Urine, Estimation of Uric Acid in: W. Camerer, 118.
- Urine, Excretion of Balsams in: R. Stockman, 116.
- Urine, New Test for Albumen in: A. Jolles, 118.
- Urine, The Ferrocyanide Test for Albumen in: A. Jolles, 119.
- Urine, The Occurrence of Hæmoporphyrin in: E. Salkowski, 116.
- Urine, Volumetric Estimation of Albumen in: F. Venturoli, 118.
- Urine, Volumetric Estimation of Chorine in: A. Corvi, 117.
- V.
- Vacher, M.: Solution of Salicylate of Mercury, 269.
- Valerian Root, The Presence of an Alkaloidal Constituent in: M. Waliszewski, 161.
- Valeriana Officialis var. *Angustifolia*, Oil of, 214.
- Valerianates of Antipyrine and Quinine as Remedial Agents: M. Sochaczewski, 275.

- Vanillin from *Rosa Canina*: A. Schneegans, 68.
- Varnish for Furniture, Russian, 293.
- Vauthier, M.: Preparation of Tinctures, 254.
- Venturoli, F.: Volumetric Estimation of Albumen in Urine, 118.
- Veratrine: F. B. Ahrens, 56.
- Veratrine: S. Stransky, 57.
- Veratroidine, 57.
- Veratrum Album, The Alkaloids of the Rhizome of: C. Pehkschen, 57.
- Veratrum Album, The Alkaloids of the Rhizome of: G. Salzberger, 58.
- Vetch and Pea, Alkaloidal Constituents of the: E. Schulze, 62.
- Vicaris, A.: Medicated Oils for Hypodermic Injection, 288.
- Vicia Sativa, 62.
- Vigier, P.: Embrocation for Chapped Hands, 281.
- Villiers, A.: Fermentation of Starch by the Butyric Ferment, 101.
- Villon, A.: Manufacture of Decolorised Tannins, 69.
- Vinca Rosea, 185.
- Vinegar, Detection of Mineral Acids in: M. Balzer, 135.
- Vinum Ferri, B.P.: J. A. Forret, 257.
- Vitali, D.: Reactions of Cocaine and Ecgonine, 127.
- Vocanga (*Orchipeda*) *Fœtida*, 185.
- Volatile Fatty Acids, Amount of, in Rancid Butter: P. Corbetta, 88.
- Volhard, J.: Crystalline Mercuric Oxychloride, 24.
- Volhard, J.: Preparation of Urea, 28.
- Vortmann, G.: Volumetric estimation of Manganese, 151.
- Vortmann, G., and J. Messinger: Volumetric Estimation of Phenols, 180.
- Vrij, J. E. de: Pomegranate Root Bark, 169.
- Vulpinus, G.: Assay of Diuretin, 32.
- W.
- Waliszewski, M.: The Presence of an Alkaloidal Constituent in Valerian Root, 161.
- Wallach, O.: Terpenes and Essential Oils, 86.
- Wallach, O., and F. Hartmann: Oil of Fennel, 215.
- Wanklyn, J. A.: Aldepalmitic Acid, A New Constituent of Butter Fat, 88.
- Warden, C. J. H.: Note on the Fruit of *Erythroxylon Coca*, 191.
- Warnecke, H.: Bettendorf's Reagent for Arsenic, 153.
- Water, Colorimetric Estimation of Nitrates in: G. Looft, 142.
- Water, Sterilisation of, 277.
- Water Supply of Cardiff, A Short Description of the Present and Future: T. Hughes, 422.
- Waters, Mineral, Estimation of Free and Combined Carbonic Acid in: H. Bretet, 144.
- Waters, Potable, A Rapid Method of Estimating Nitrates in: G. Harrow, 143.
- Waters, Potable, Estimation of Nitric and Nitrous Acids in: M. Rosenfeld, 143.
- Wax, Dentists' Moulding: P. David, 282.
- Waxes, Fats, etc., A New Method for the Saponification of: A. Kessel and K. Obermüller, 89.
- Waxes, Resins and Solid Fats, Simple Method for Determining the Specific Gravity of: A. Gawalowski, 228.
- Weiss, F. A.: *Artemisia Frigida*, 177.
- Welter, A., and A. Claus: Bromo-Derivatives of Quinoline, 55.
- Wender, N.: Jambul Bark, 168.
- Wernecke, M., and E. Schmidt: Caffeidine, 40.
- Wetzel, A.: Detection of Carbonic Oxide in Blood, 111.
- Whelpley, H. M.: Remedies for Corns, 279.
- Whitby, A., and R. A. Cripps: Report upon *Ipecacuanha*, 385.
- Widman, O.: The Constitution of Cymene, 86.
- Wijsman, H. P.: The Chemical Nature of Diastase, 93.
- Wilde de, and A. Reyckler: Preparation of Chlorine for Technical Purposes, 20.
- Will, H.: Purity of Glycerine, 138.
- Will, H.: Separation of Antifebrin and Phenacetin, 128.
- Wilson, J. A.: The Purity of Castor Oil, 224.
- Wine, Estimation of Acid Potassium Tartrate, Free Tartaric Acid, Malic Acid, and Mineral Salts in: M. Schneider, 186.
- Wines, Injurious Effects of Sulphurous Acid present in: L. Pfeiffer, 277.

- Wines, The Bouquet of: G. Jacquemin, 105.
 Wishart, J. E.: Extractum Jalapæ Alcoholicum, 258.
 Wolfenstein, R., and A. Pinner: Nicotine, 47.
 Wood, J. M.: Notes on Natal Aloes, 202.
 Woroschilsky, M.: The Toxic Action of Uranium Salts, 251.
 Woteczal, M. E.: Distribution of Solanine and its Micro-Chemical Reactions, 37.
 Wright, R., and E. H. Farr: The Solvent Action of Alcohol of Different Degrees of Strength on some of the Drugs used in Making Pharmacopœial Tinctures, 253, 495.
 Wyatt, H.: Note on Ichthyol, 232.

X.

- Xanthorrhœa Arborea, 210.
 Xanthorrhœa Australis, 210.
 Xanthorrhœa Hastilis, 210.
 Xanthorrhœa Preissii, 210.
 Xanthorrhœa Tateana, 210.

Y.

- Ye Kwei (*see* article on Chinese Cinnamon), 170.
 Yerba Santa: H. C. Cleveland, 180.
 Youle, W. E., and Dr. S. Rideal: Indian Gums for Pharmacy Work, 405.
 Young, W. C.: Estimation of Alumina in Bread, 135.
 Yvon, P.: Antiseptol, or Iodo-Sulphate of Cinchonine, 276.

Z.

- Zawadski, J.: Composition of the Pancreatic Juice in Man, 112.
 Zawadski, J.: Sugar of Milk as a Diuretic, 250.
 Zinc Sulphite, for Antiseptic Dressings: C. R. C. Tichborne, 288.
 Zinc, Volumetric Estimation of: E. Donath and G. Hattensaur, 151.
 Zinc, Volumetric Estimation of: L. Blum, 152.
 Zoelfell, G.: The Tannins of Algarobilla and of Myrobalans, 68.
 Zuco, F. M.: Constituents of Chrysanthemum Cinerariæfolium, 176.

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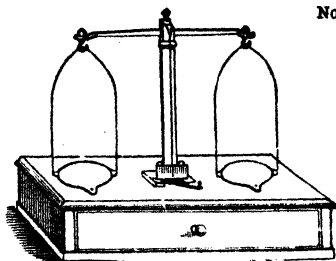
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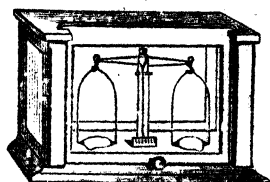
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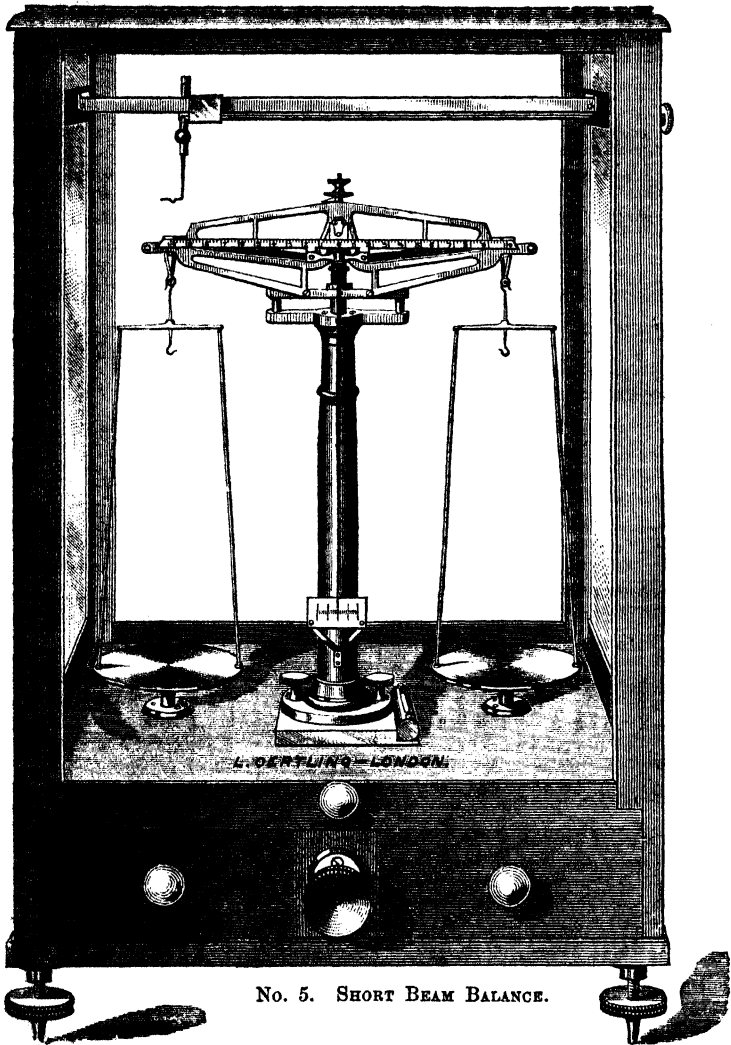
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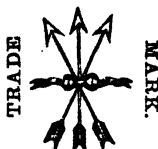
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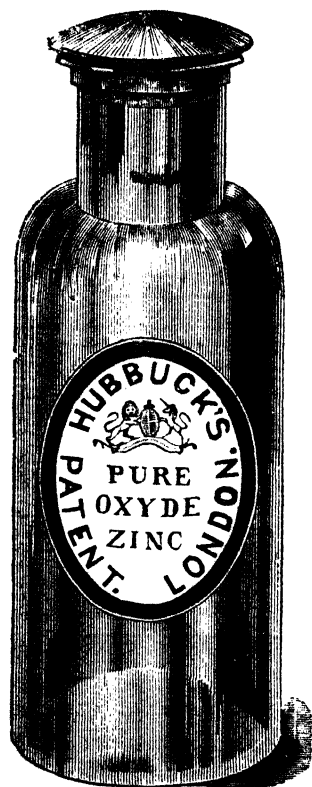
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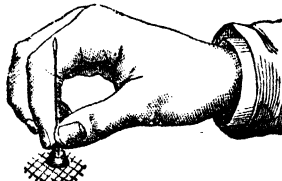
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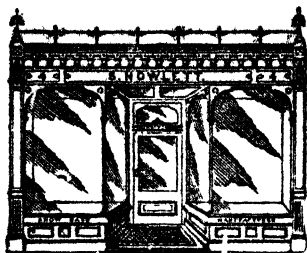
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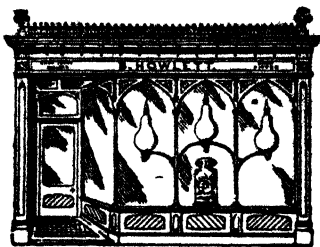
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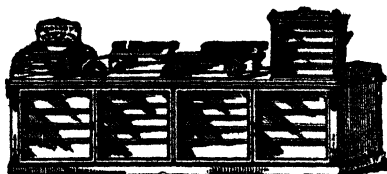


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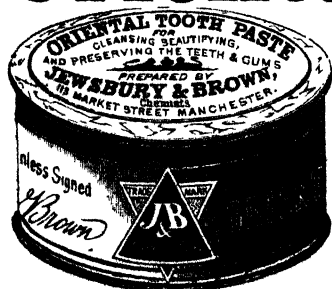
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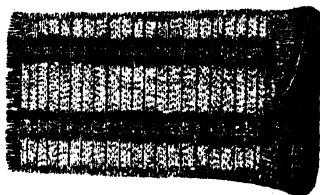
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LADIES' quality, light hair and soft pile. GENT'S quality, black or grey, and pile of various
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	Per doz.		Per Doz.
C Cemented	2/-	Warranted Best, stamped with Royal	
Cemented	2/6	Arms	5/8
Cemented London	3/-	Extra Best, stamped with Trade Mark	
Cemented Improved	3/6	and "Coate & Co., London"	6/6
Cemented Warranted	4/-	5 Rows	4/-; 6/-
Cemented Warranted Extra	4/6	5 Rows, extra best and to pattern	8/-
Cemented Superfine, stamped with			
Elephant	5/-		

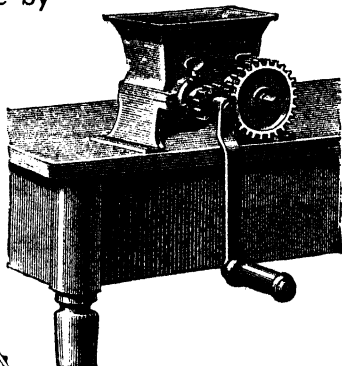
All the above qualities are sent out assorted in patterns and hardness, except the extra best, which only can be sent to pattern.

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BRUSHES, etc., kept ready for Merchants' Shipping Orders.**

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For mixing every kind of Pill Mass, Tooth Paste, Ointment, etc., with precision unobtainable by any other means.



Size 3, for $\frac{1}{2}$ to 1 lb. Mass.

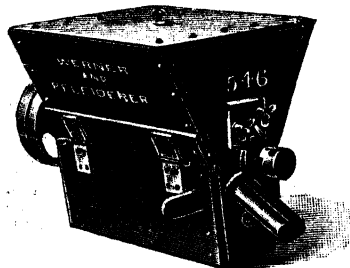
Made in many sizes, for both Hand and Steam Power.

Pill Pipes, Cutters, Rounders, Coaters, and every requisite for the Pill Room.

THE "SPIRAL BRUSH" SIFTER.

The most efficient Apparatus for all sorts of Powders.

FIG. 357



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** " d'Or	7 " "
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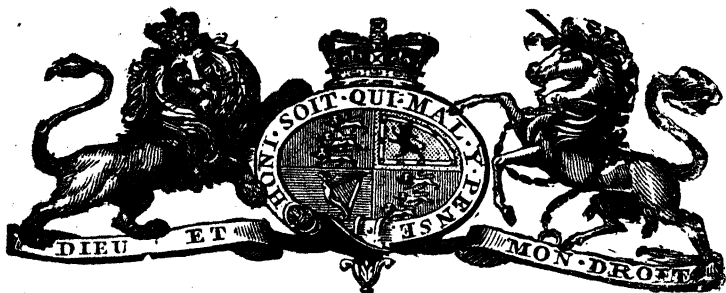
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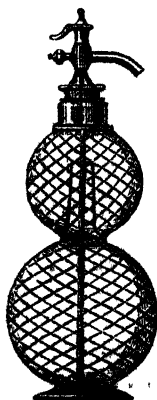
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INDEX TO ADVERTISEMENTS.

	PAGE
Acme Chemical Company's Weed Killer	571
Altschul (Dr.), Development of Voice. Impediments of Speech Removed.	553
Apollinaris Table Water	592
Association for the Supply of Pure Vaccine Lymph	569
Atkinson (G.) & Co.'s Specialites in Drugs and Chemicals	575
Attfield's (Dr.), Chemistry (Gurney & Jackson)	552
 Bailly & Coates' Examinations	 552
Beale's (Dr. L. S.) Works (J. and A. Churchill)	548
Benger's Preparations of the Natural Digestive Ferments	567
Black's (Dr.) Malted Food	584
Bowers Brothers, Medical Printers, etc.	556
Bowling & Govier, High Class Shop Fittings	578
Bradley & Bourdas's American Cherry Pectoral	570
Bramwell (E.) & Son's Epsom Salts, Cream Caustic Soda, etc.	568
Brecknell's Skin Soap	572
Brewer & Marston's Chemical Food, Pharmaceutical Preparations, etc.	564
Bullock's Pepsina Porci and Acid Glycerine of Pepsine.	560
Burrow (W. & J.), Malvern Table Waters	580
 Carpenter on the Microscope (J. & A. Churchill)	 551
Chavasse's (Mr. Pye) Works (J. & A. Churchill)	559
Chemists Aerated & Mineral Water Association	587
Christie, Geo., Limited, Wire Drawers	528
Churchill's (J. & A.) Books for Pharmaceutical Study and Practice	549
Coate & Co.'s London Brush Works, Axminster	582

	PAGE
Cooley's Cyclopædia of Practical Receipts (J. & A. Churchill)	550
Cox & Co.'s Tasteless Pills.	564
Dinneford & Co.'s Horsehair Goods, etc.	580
Epps (Jas.) & Co.'s Homœopathic Medicines	562
Erhardt's Skins, Vegetable Parchment, Tinfoil, Plaster, etc.	568
Ferris & Co.'s Nepenthe, Cascara, Chocolate Bonbons, etc.	566
Fink (F.) & Co.'s Specialities	568
Ford, Shapland & Co., Medical Label and General Printers	558
Foster's (F. F.) Pearl Coated Roup Pill	568
Foster's (M. E.) American Bay Rum	584
Geraut (Eugene) & Co.'s Soda-Water Machines, Seltzogenes, etc.	590
Gibbs, Cuxson & Co.'s Surgical Dressings, etc.	576
Gibson & Sons' Druggists' Confectionery	574
Gould & Son, Homœopathic Medicines	564
Grimwade, Ridley & Co.'s Oil of Eucalyptus	569
Harker, Staggs & Morgan, Wholesale Druggists, etc.	563
Haynes & Co.'s Bleached and Absorbent Cotton Wools	572
Haywood (J. H.) Elastic Surgical Appliances	577
Heisch's (C.) Fees for Analysis, etc.	556
Hirst, Brooke & Hirst's Drugs, Chemicals, etc.	572
Houlder, Son & Co.'s Acids, Commercial and Pure	568
Howlett's Shop Fittings	578
Hubbuck's Pure Oxide of Zinc	565
Idris & Co.'s Table Waters, Syphons and Seltzogenes	589
Ince's (Joseph) Latin Grammar of Pharmacy (Bailliere & Co.)	548
Ingram & Royle's Vichy, Carlsbad, and other Natural Mineral Waters.	591
James's (Dr. Prosser) Works (J. & A. Churchill)	552
Jewsbury & Brown's Oriental Tooth Paste	579
Levermore (A.) & Co.'s Precipitated Chalk Chemicals, etc.	570
Liquor Carnis Company's Specialities	585

INDEX TO ADVERTISEMENTS.

595

	PAGE
Lloyd's (A. S.) Euxesis for Shaving	579
Locking (W.) & Son, Glickon's Salve	570
Macfarlan (J. F.) & Co.'s Pharmaceutical Preparations.	562
Manchester College of Chemistry and Pharmacy (W. S. & C. Turner) .	554
Maril's Fine Cognac Brandies (W. H. Chaplin & Co.)	584
Mawson's Filters and Freehand Ink.	584
Mills (E. J.) & Rowan (F. J.), Fuel and its Applications (J. & A. Churchill)	552
Mills & Co.'s Bourne Waters	588
Oertling (L.), Manufacture of Balances	557
Orridge & Co.'s Chemists' Transfer Agency	553
Potter & Clarke, Export Botanic Druggists	571
Renner's (Dr.) Establishment for Calf Lymph Vaccination	568
Robinson & Sons' Surgeons' Lints, Cotton Wools, etc.	577
Root & Co.'s Cuca, Cocoa and Chocolate	586
Rouse & Co., Matthews' Waxed Papers	576
Sanford & Son's Rat Poison	570
Schacht (W.) & Co.'s Kronenquelle, and other Waters	588
School of Pharmacy of the Pharmaceutical Society	553
Self-Opening Tin Box Company	578
Southall Brothers & Barclay's "Standard Tinctures"	559
Steiner's Vermin Paste	570
Stone's (W.) Dispensing Analytical Balances.	556
Thiellay's Eau Fontaine de Jouvence, Golden, etc.	581
Tyrer (Thos.) & Co.'s Pure Chemicals for Pharmacy, Photography, etc.	573
Werner & Pfeiderer's Pill Mass Mixers and Kneaders	583
Whiffen's Quinine and other Preparations	575
White (A.) & Sons, Chemical Manufacturers	570
Willows, Francis & Butler, Oxydides of Calcium and Bismuth. .	560

	PAGE
Wilson (D. E.) Institution for Hospital-trained Nurses and Male Attendants	555
Woolley (J.), Sons & Co., Drug Millers, Wholesale Druggists . . .	561
Wright, Layman & Unney, Wholesale and Export Druggists . . .	547

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